OUND & MUSIC

U.S.A. $2.50
CANADA $3.00

Antic™

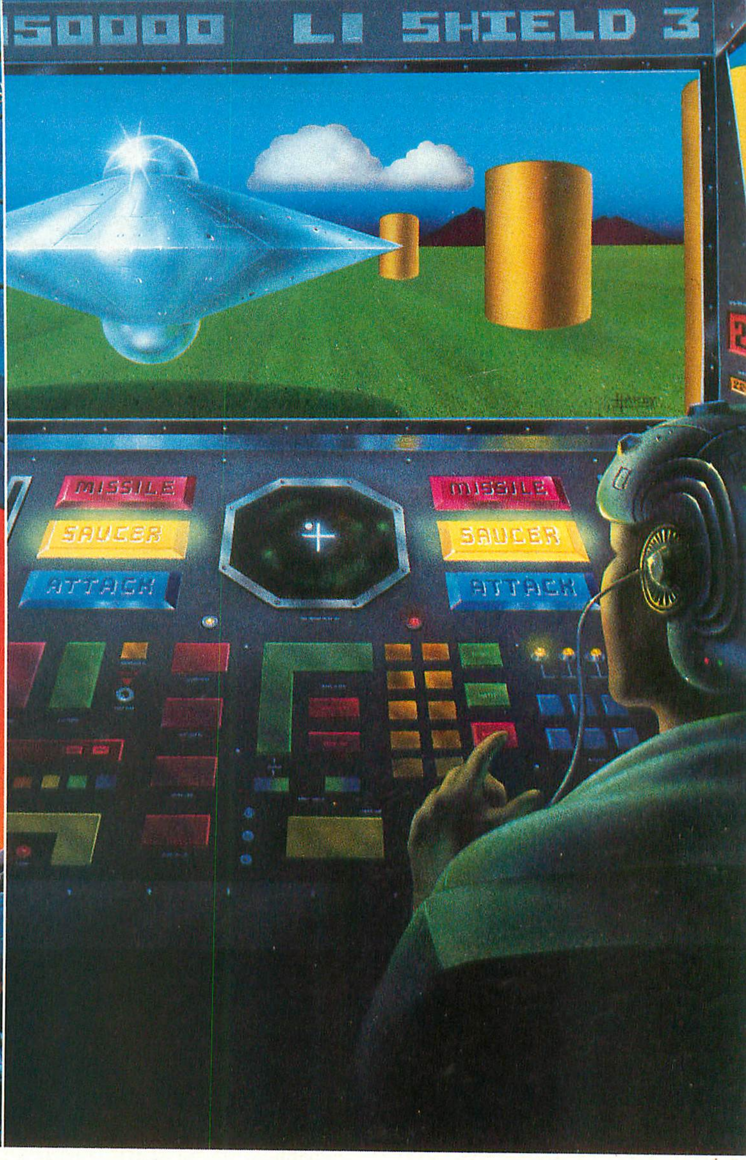
The ATARI® Resource

NOVEMBER 1983 VOLUME 2, NUMBER 8

- Atari Service System
- ATARI Sound Editor
- Simple Synthesizer
- "Air Raid" Game
- Antic Pix Gifts







HELP OUR POOR BOY MAKE GOOD!

Quasimodo thinks the world got up on the wrong side of the bed. Quasi has been falsely accused of stealing the royal jewels. Quasi knows where they are. He'd give them back if only the nasty soldiers would leave him alone. Help Quasi run, climb and jump his way through a bell ringer's nightmare.

Quasimodo™ is a multiple level arcade adventure game.

CAN YOU SURVIVE THE ENCOUNTER?

Alone, on a distant world, you've triggered an ancient civilization's combat training course—a test that ensures that only the fittest will survive. Suddenly a drone whistles in for the kill. You dodge behind a pylon, swivel the gun turret and desperately stab the fire button. The drone flashes white hot! As you heave a sigh of relief, the radar sights two new ships...

Encounter™ is an awesome action, 3-D scrolling game that will leave you breathless!

Both games are for the Atari® 400/800/XL™ series in 32K disk and cassette. Available at software dealers everywhere. Or order direct from Synapse Elite. Only $34.95 plus $2 shipping and handling (California residents add 6½% sales tax). Send check, money order or your Visa/Mastercard number.

synapse
SOFTWARE

5221 Central Avenue, Richmond, CA 94804 • (415) 527-7751







TRAK'S floppy and hard disk drive systems for the Apple and IBM-PC are available at many Computerland and other fine stores worldwide.

. . .WITH IT'S FLEET OF THE MOST ADVANCED SINGLE AND DOUBLE DENSITY DRIVE SYSTEMS IN THE UNIVERSE - TOTALLY COMPATIBLE WITH ATARI* COMPUTER MODELS 400, 800, 600XL, 1200XL, 1400XL, AND 1450XL.

DOCK YOUR FAVORITE PRINTER DIRECTLY TO OUR DRIVE'S BUILT-IN PARALLEL PRINTER INTERFACE. THERE'S NO NEED TO BUY AN EXPENSIVE ATARI 850 MODULE.

THE COMMAND CONTROL PANEL FEATURES READ, WRITE AND DENSITY INDICATORS, A TRACK COUNTER TO LOCATE EVERY BIT OF YOUR DATA AND A TOUCH-SENSITIVE SWITCH TO PROTECT IT.

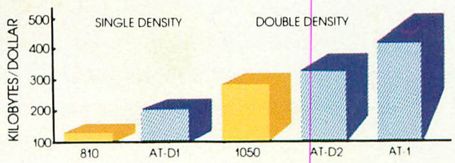
WARP SPEED OF UP TO 18 TIMES FASTER THAN **ANY** OTHER ATARI DRIVE IS ACHIEVED WITH OUR OPTIONAL TURBO-CHARGED SOFTWARE.

AWESOME POWER — DESTROY A PLANET OR LEARN HOW ONE IS CREATED. BALANCE YOUR CHECKBOOK OR WRITE A BESTSELLER. LEARN A NEW LANGUAGE OR CREATE ONE.

IT'S MAGNIFICENTLY SIMPLE! — JUST PLUG IT IN AND LIFT-OFF!

*Atari is a registered trademark of Atari, Inc.

TRAK GIVES YOU THE MOST STORAGE FOR YOUR DOLLAR!

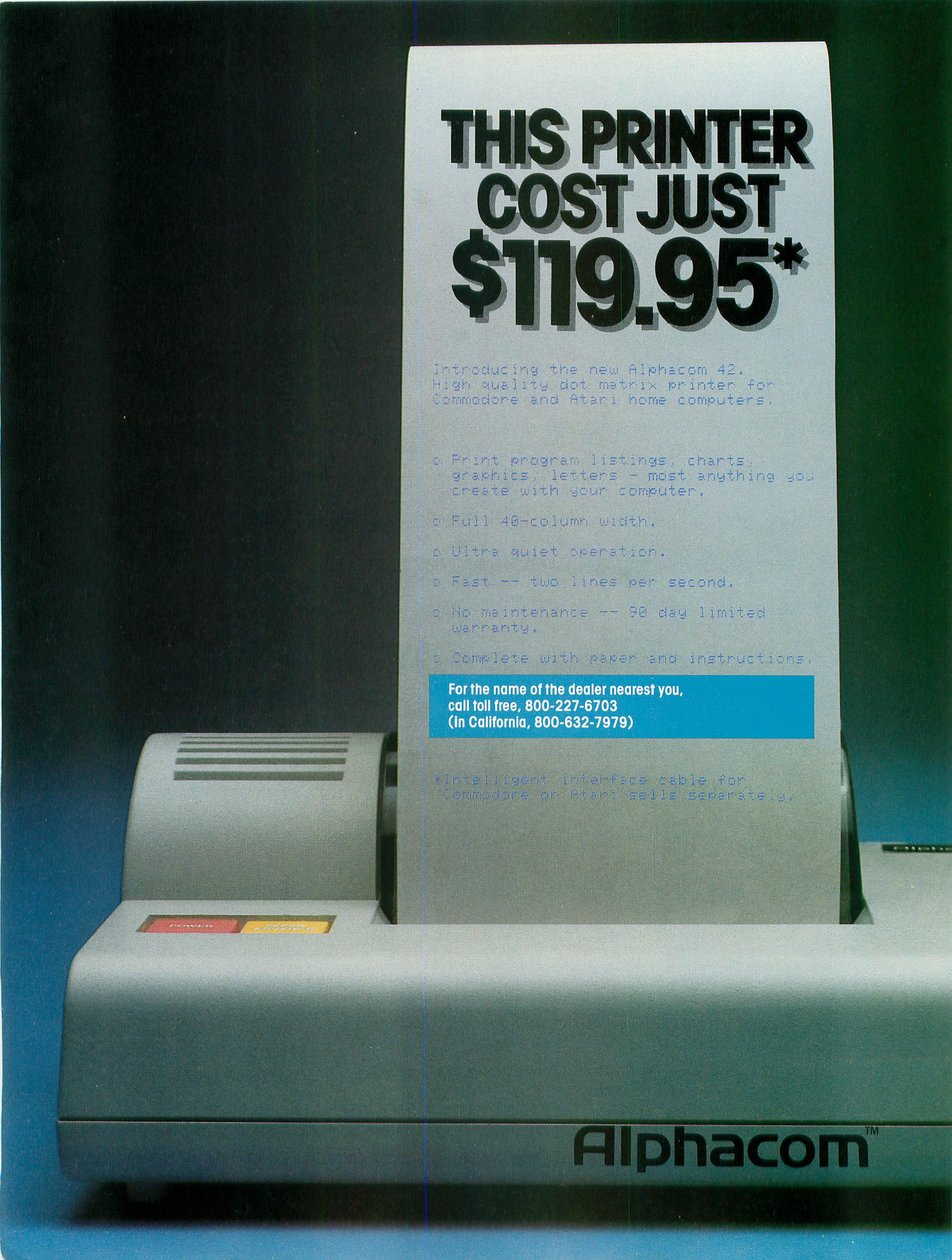


OUR FLAGSHIP, AT-D2, WITH TWICE THE STORAGE CAPACITY OF THE ATARI 810 DRIVE PLUS A PRINTER INTERFACE AND COMMAND CONTROL PANEL, HAS A VALUE OF OVER $1000 YET COSTS LESS THAN $500!

SEE YOUR DEALER NOW FOR A TEST FLIGHT, OR

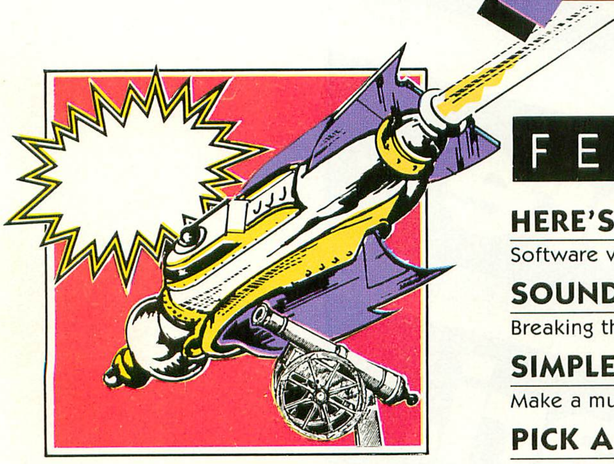
call toll free: **1-800-323-4853**
in Illinois, call collect: 1-312-968-1716
TWX 910-222-1848

trak™
A commitment to quality
microcomputer corporation 1511 Ogden Ave., Downers Grove, IL 60515


THIS PRINTER COST JUST $119.95*
Introducing the new Alphacom 42. High quality dot matrix printer for Commodore and Atari home computers.
o Print program listings, charts, graphics, letters - most anything you create with your computer.
o Full 40-column width.
o Ultra quiet operation.
o Fast -- two lines per second.
o No maintenance -- 90 day limited warranty.
o Complete with paper and instructions.
For the name of the dealer nearest you, call toll free, 800-227-6703 (in California, 800-632-7979)
*Intelligent interface cable for Commodore or Atari sells separately.
Alphacom™

Antic™

The ATARI Resource NOVEMBER 1983 VOLUME 2, NUMBER 8



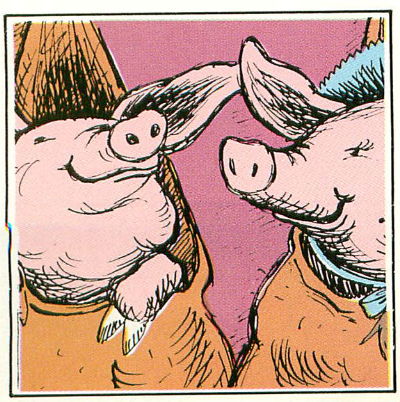
page 28

FEATURES



page 34

DEPARTMENTS



page 82

Look what we have in store for your Atari.

Arti Haroutunian has done it again.

The mind behind our first Atari® success, *Kid Grid,* has just dreamed up another one: *Juice!*

And if you don't think that's electrifying, consider what the experts are saying.

Electronic Fun with Computers and Games says that *Kid Grid* "may sound like kid stuff, but it isn't. Even on the slowest setting ...the game is quick enough to challenge almost anyone."

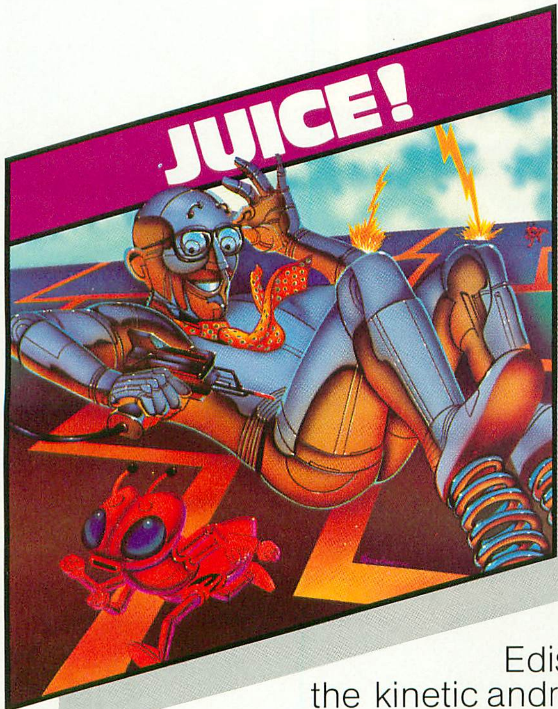
That's right. And that's not all.

Electronic Games calls the Kid "Hypnotic, appealing, fast-moving arcade action of the highest calibre, ...one of the most compulsive, utterly addictive contests in the world of computer gaming."

We couldn't agree more.

What will the critics say about *Juice!?* Will they like its colorful graphics, superior sound effects, charming characters and challenging play patterns?

Why wait around to find out?



Edison, the kinetic android, leads a frustrating life.

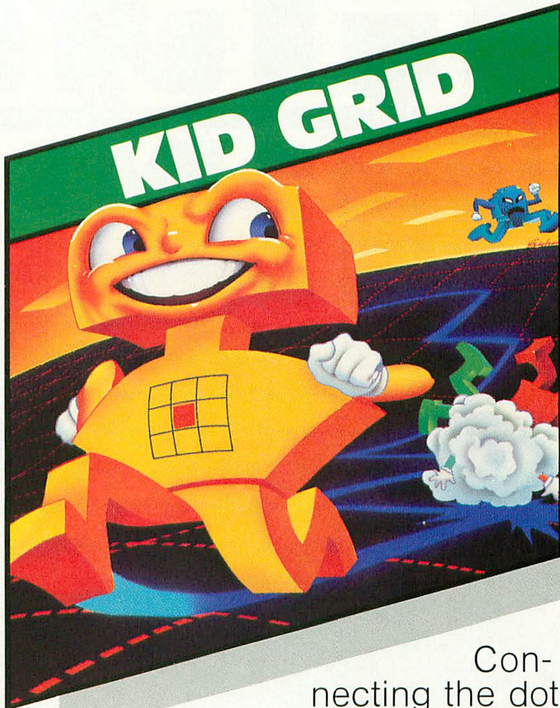
All he wants to do is build his circuit boards and go with the flow. But things keep getting in the way.

Nohms—a negative influence—bug him constantly. Flash, the lightning dolt, disconnects everything in his path.

And the cunning Killerwatt is out to fry poor Edison's brains.

You'll get a charge out of this one. And a few jolts, too!

(Requires 32K memory. Suggested retail $29.95)



Connecting the dots on our colorful grid should be easy, right?

Wrong. Because the bullies are in hot pursuit!

Squashface, Thuggy, Muggy and Moose are their names. And *you* are their game. And what's more, they're faster than you are.

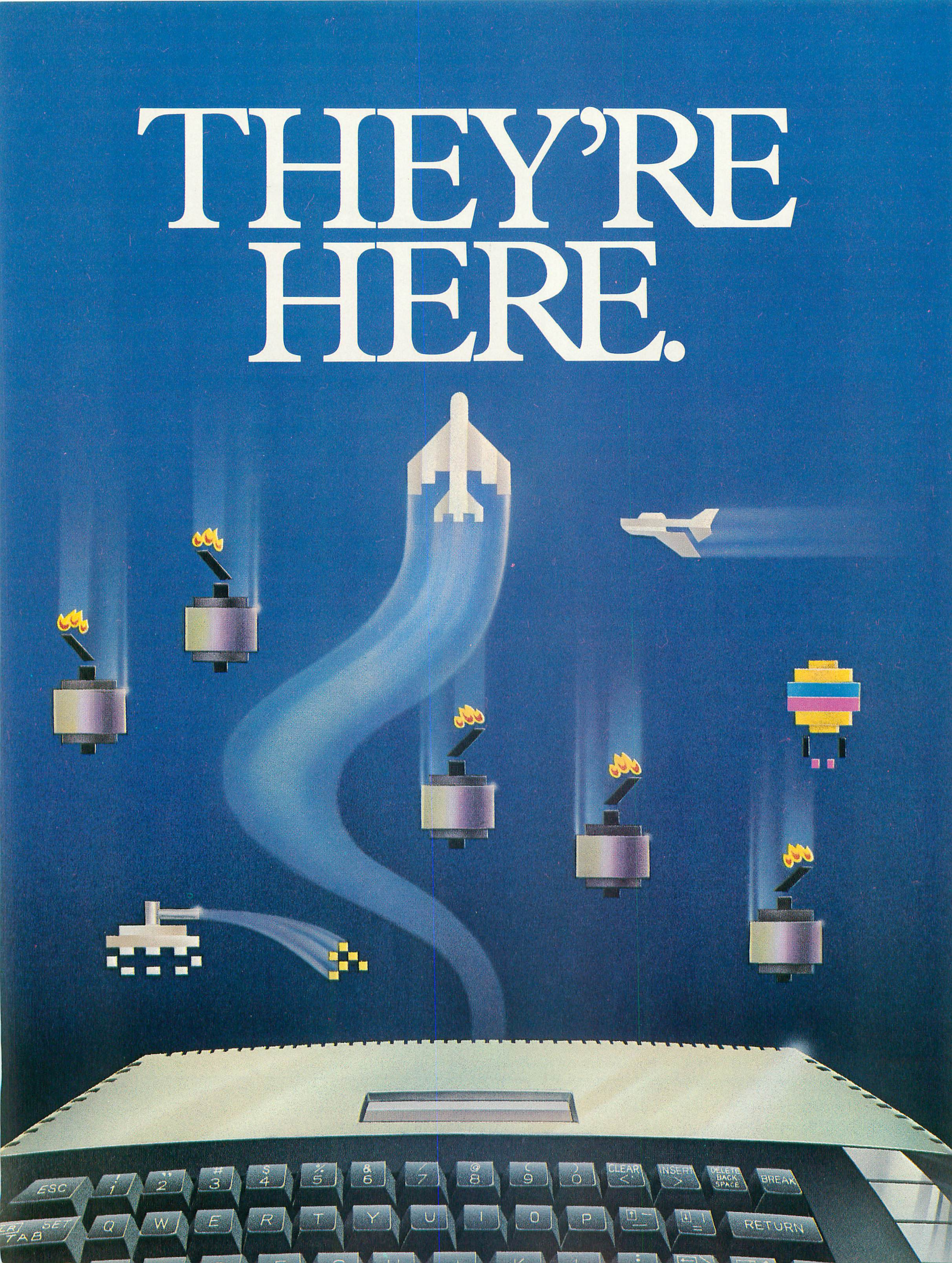
But you're smarter. And you control the stun button.

So keep your eyes peeled for the mysterious question mark and don't slow down at corners!

(Suggested retail: $29.95)

TRONIX™

8295 South La Cienega Blvd., Inglewood, CA 90301
Available on diskette or cassette for your Atari 400, 800 or 1200 computer.


THEY'RE HERE.
ESC
CLEAR
INSERT
DELETE BACK SPACE
BREAK
RETURN

River Raid™ and Kaboom!® are here. And your Atari® home computer just became more fun than ever.

Because River Raid and Kaboom! have been re-designed to take full advantage of home computer capabilities.

Far beyond anything you've ever experienced before in video games.

Unique graphics, crisp detail and brilliant sound all come together with spectacular impact.

River Raid,™ the battle adventure up the "River of No Return."



The realism of Carol Shaw's River Raid is utterly amazing.

It challenges your reflexes, stamina and strategic savvy as you battle your way up the winding river.

Enemy choppers. Jets. Tanks. Hot-air balloons. Ships. All out to blow you to smithereens.

But you strike back.

Keeping one eye on the ever-changing terrain.

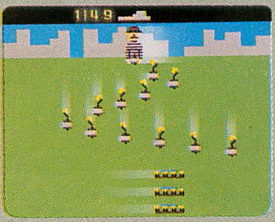
Bridges. Mountains. Canyon walls. Islands.

One false move and it's curtains.

And if you're up to it, now you can skip easier sections of the river and get right to the heart of the battle.

Everything that made River Raid such a smashing hit is here. And tons more.

Kaboom!®, the award-winning game of catch with buckets and bombs.



Larry Kaplan's Mad Bomber is back. The buckets are back.

But now, in Paul Willson's adaptation, you can drop the bombs, while someone else tries to catch them.

Imagine dropping bombs. Faster and faster.

To the ever-quickening pace of the 1812 Overture.

You shift right. Left. Back again. All the way right.

He misses! You win!

Now it's your turn to catch. The pressure mounts.

The bombs start flying. You dash to catch them.

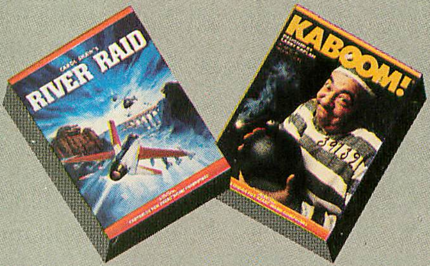
And so it goes on into the night.

And everytime you hit a new high score, it's displayed after the game, just like at the arcade.

Kaboom! and River Raid for your Atari home computer.

They're here.

Just for the fun of it.



ACTIVISION®

ANTIC
Publishing

Publisher
James Capparell

Managing Editor
Robert DeWitt

Assistant Editor
Christopher Rauber

Technical Copy Editor
David Duberman

Editorial Assistant
Caitlin Morgan

Editorial Clerk
Arla Ertz

Contributing Editors
Carl Evans
Ken Harms
John & Mary Harrison
David & Sandy Small

Technical Consultant
Jerry White

Art Director
Marni Tapscott

Production Artist
Kyle Bogertman

Contributing Illustrators
Lilianne Milgram
Beatrice Benjamin

Cover Illustration
Bud Thon

Circulation Manager
Les Torok

Subscriptions
Kathryn Katz
Julianna Hoffman

Advertising/Production Coordinator
Linda Tapscott

Advertising Sales
Steve Randall
(415) 661-3400

November 1983
Volume 2, Number 8
ANTIC—The ATARI Resource, is published twelve times per year by ANTIC Publishing. Editorial offices are located at 600 18th Street, San Francisco, CA 94107-3076. Telephone is (415) 864-0886. ISSN 0745-2527. Second Class Postage paid at San Francisco, California and additional mailing offices. POSTMASTER: Send address change to **ANTIC**, 600 18th Street, San Francisco, CA 94107.

Editorial submissions should include program listing on disk or cassette, and text file on media and paper if text was prepared with a word processor. Media will be returned if self-addressed stamped mailer is supplied. **ANTIC** assumes no responsibility for unsolicited editorial material.

I/O BOARD

LANGUAGE TALK

Can you tell me what programming languages are available for the ATARI 800? Also, do they require use of a cartridge?

Dave Peterson
Irvine, CA

Languages available from Atari for their computers include Atari BASIC, Atari Microsoft BASIC, PILOT, Assembler Editor (assembly language), and Logo, all on cartridge. The Atari Program Exchange (APX) sells versions of Pascal and Forth on disk (Pascal requires two disk drives). Optimized Systems Software offers an extended version of BASIC called BASIC A+, a C compiler, and a macro assembler editor. They will soon release several new languages on cartridge, including BASIC XL, MAC/65, and a remarkably fast new compiled language, available only for the ATARI, called ACTION!

In addition, there are two compilers for Atari BASIC programs: one from Datasoft and another from Monarch.

—ANTIC ED

TINY TEXT STRIKES AGAIN

Tiny Text (ANTIC March 1983), is a handy little program for writing to ANTIC with improvements to Tiny Text. I recently tried to save a Tiny Text file on a too-full disk. I got ERROR 162, so I switched to a fresh disk and attempted to save again. This time, I got ERROR 129 (IOCB already open), and when I pressed [RETURN] again, the program crashed.

Since ERROR 162 is an old acquaintance of mine, I added "CLOSE #3" to the beginning of line 950 to close the channel to the disk drive before an error could occur. Next time I try to shoe-horn too much data onto a nearly-full disk, I'll be able to switch disks, hit [RETURN], and go on to the SAVE option again.

Jack Mindy
Buffalo, NY

HAMSTRUNG BY THE 800

A few months ago I received an ATARI 800 as a graduation present. Having previously owned a TRS-80 Model III, I was shocked to find that the 800's strings cannot be subscripted. Is there hope for a guy who wants to use string arrays and matrixes to create adventure programs? I was also surprised to discover that array variables cannot be used in READ statements on the 800. Doesn't this restrict a programmer's ability to manipulate data? I though the 800 was supposed to be a flexible machine.

Sean White
Minneapolis, MN

The 800 is indeed a flexible machine — the problem you're having is with Atari BASIC, not with the computer. Certain sacrifices had to be made to fit the language into an 8K cartridge, so string arrays were left out. It's not difficult to simulate string arrays in Atari BASIC — the technique has been discussed in various sources.

To use READ with array data. READ the data into a variable, then assign it to the array element:

```
10 DIM ARRAY(11)
20 FOR I= 1 TO 10: READ A:
   ARRAY(I)=A
30 NEXT I
```

—ANTIC ED

HELP WITH HOOKEY

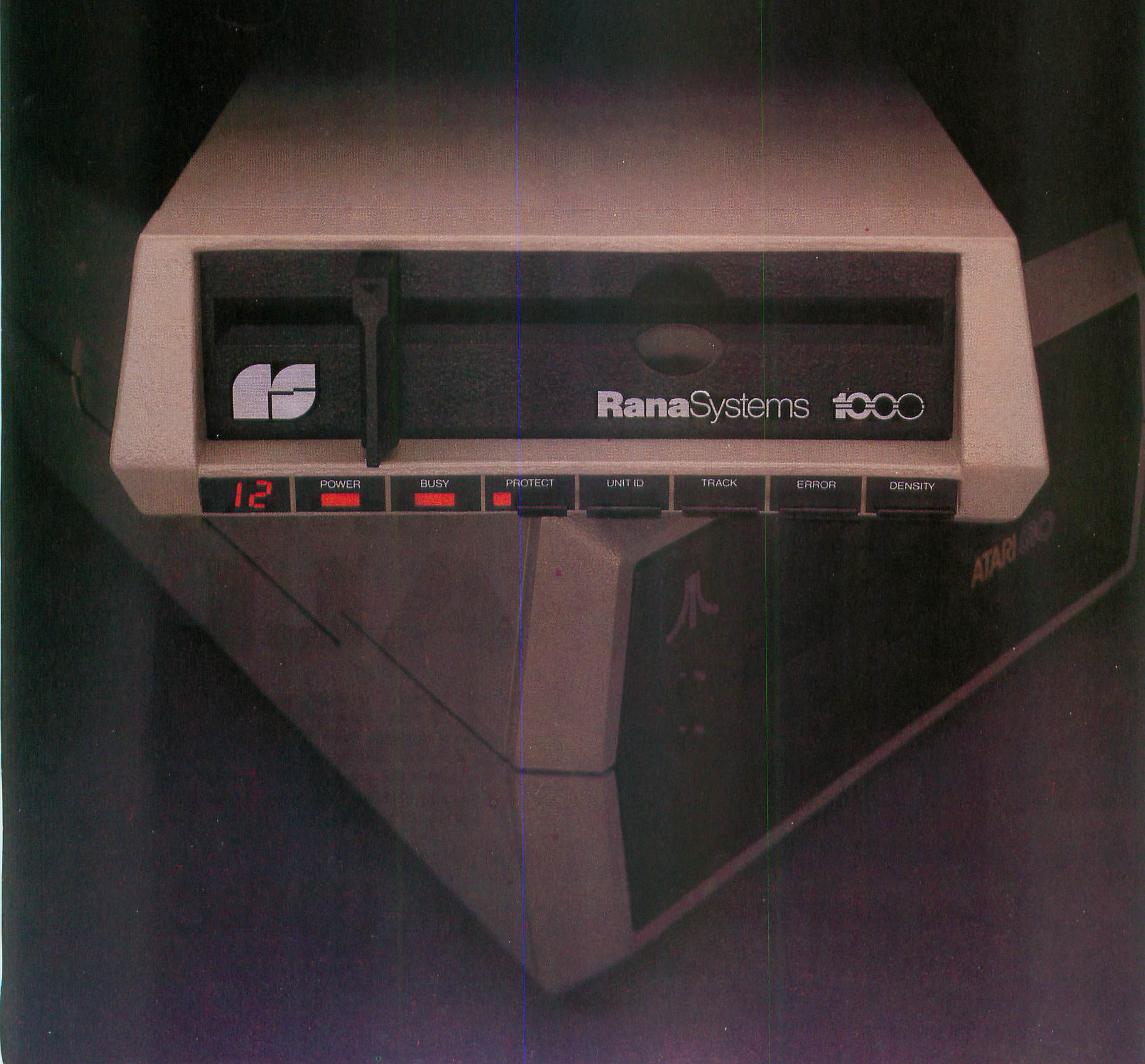
There's a minor flaw in the HOOKEY! game by David Plotkin in the September issue. If the player tries to jump above the topmost cube, the game will freeze and make resumption of play rather difficult. This can be corrected by copying line 400 into line 401 and writing in its place:

```
400 IF YP0<0 THEN YPO = 0
```

Michael A. Pemberton
San Luis Obispo, CA

continued on page 14

We just made owning an Atari computer a lot more logical.



Introducing the Rana 1000 disk drive. It's a whole new game for Atari computers.



This two digit LED readout displays a code that tells you everything you need to know.

This beeping button tells you your write protect feature is keeping your information safe.

The remaining buttons beep when touched, and provide readouts on density storage, error status, and drive number.

This button beeps when you touch it, and the LED readout tells you what track you're on.

When Rana Systems introduced the Elite Series of Apple® compatible disk drives, we didn't know what a tremendous impact they would make. It turned out to be a line so outstanding in performance, styling, capacity, and price, that it instantaneously made us a major force in the market. Well, needless to say, the response was so great that we were forced to create the same highly advanced disk drive for Atari.® A disk drive that when coupled with Atari's computer, could perform everything from accounting, financial planning, and stock charting, to word processing, business management, and letting you write your own programs. Plus, we made it simple enough for a child to use, for learning anything from the alphabet to a foreign language.

Working with a diskette versus playing with a cassette.

Let's face it. The only reason Atari made a cassette option to their computer was to make it affordable. But now you don't have to settle for less. Because now you can get a diskette for your Atari computer which outperforms their cassette and costs ⅓ less than their disk drive. With Atari's cassette you only get half the functions of a computer compared to what our floppy disk can give you. Their cassette is not only limited in the software available, but it also takes 20 times longer to get the information you need. And Rana's disk drive offers twice the storage capacity of either their cassette or disk drive.

Why even stylewise our new low profile design not only looks 100 times more spectacular, but it occupies 3 times less space. And our new Rana 1000 also gives you a piece of its mind every time you use it, because our disk drive gives you information as well as takes it. And we think that says a lot.

The disk drive that has all the answers.

Rana offers you a myriad of features Atari couldn't even conceive of. Like five electronic functions on the front panel that actually beep and give you a LED readout when touched. Our disk drive tells you what track you're on, and what density and how much information you're storing. It lets you switch from a single density of 90,000 letters to a double density of 180,000 letters, on a single diskette. And, we have a write protect feature which protects your diskette from being erased. In fact, no other disk drive can offer you that.

As you can see, it was easy to build a disk drive superior to Atari's. Because for every reason you buy a disk drive, Rana has superior technology.

The Rana 1000 disk drive. It brings your Atari computer to a higher level of sophistication for a price one third lower than Atari's. So your choice shouldn't even be a matter of logic.

Just common sense.

RanaSystems *Always a step ahead of the originals.*

Available at all participating Computerland stores and other fine computer dealers.

® Apple is a registered trademark of Apple Computer, Inc. ® Atari is a registered trademark of Atari, Inc., a Warner Communications Company. See us at the West Coast Computer Show. Circle 44

I/O BOARD

NEC NOTES

When I use my 800 with a NEC PC-8023A-C printer (Microbits MP1100 interface) and AtariWriter, the combination works beautifully. I can't call up the graphics and special characters of the NEC with the AtariWriter, but using [CTRL] [O] 14,15,27,78 etc. I am able to underline, change font size, and call up enhanced characters. When I'm working on mathematical manuscripts, I use the following BASIC program to gain easy access to superscripts, Greek and Hebrew characters, and other characters available through the NEC using Atari logo key and [CAPS/LOWR], etc. I can't imagine a simpler word processor than this:

```
10 DIM A$(100)
20 INPUT A$
30 LPRINT A$
40 GOTO 20
```

The only thing you have to watch out for is not to exceed five characters in the third line on the screen; otherwise copy is incorrectly broken at line's end.

John F. Leahy
Chualar, CA

GENUINE HACKING

I am 16, and have designed and built a 64K select RAM for my ATARI 800. I would like to know if it is possible to add the full processor bus that will be available in the new XL line on my 800. Also, is the main circuitry (with the exception of the bus) the same or totally different? If I can add the bus to my 800, I can avoid buying a new 800XL.

Ed Kunz
Alliance, OH

You can access the main processor bus signals from the motherboard (CPU card), but this will require some "hacking" in the literal sense, as "with a hacksaw." You'll have to dismantle your computer to determine where to cut holes (near the back where the video cable is) in the plastic and aluminum casing to get at the bus. These signals are used by Atari for quality assurance purposes. We won't know about compatability until the new line is officially released. See Atari's Hardware Manual for further reference.

—ANTIC ED

HOOKEY

Instructions for the game Hookey! (ANTIC p. 57, September 1983) are somewhat misleading. You get a thousand points for completing each rock pile, and an extra life for every thousand points you earn by stepping on blocks. The thousand-point bonus for each rock pile does not count toward extra lives.

COMPUTERS FOR HANDICAPPED

I teach and work with severely (orthopedically) handicapped children and teenagers. Many of these kids would like to operate a computer or play video games but, because of their situations, cannot. I am working on a project to make it possible for at least a few of them to enjoy the fruits of today's electronic technology. I would like to know of others who are working on similar projects.

Ralph L. Folsom
780 N. Fair Oaks Ave.
#26
Sunnyvale, CA 94086

DISK DRIVE TIP

Here is a tip for all disk driver users. Always start the program you are working on with:

```
1 REM SAVE "D:Filename.ext"
```

Then, as you type in the program, you can delete the line number and the REM to save your work to the disk, and not forget the filename you were using. This saves me a lot of grief when that old ATARI BASIC bug creeps into my work and locks up the keyboard. I recommend saving the program every 100 line numbers.

R.M. "Doc" Livingston
Northbrook, IL

ON HOLD

We recently purchased an Anchor Signalman Mark VII modem and DataSoft's Teletalk program. Both work well with our ATARI 800. Is there any way to use the modem's auto-answer and auto-dial capabilities with Teletalk? We were informed that a machine language program must be used to take advantage of these features.

Bill and Dot Pyle
Puuene, Maui, HI

It would be extremely difficult to modify Teletalk to use your modem's auto-dial and auto-answer capabilities. In fact, there is no such commercial terminal software currently available for the ATARI. However, due to the increasing availability and decreasing prices of sophisticated modems, such programs should be available in the near future.

—ANTIC ED

YOUR OWN BBS?

How about an article on how ATARI owners can start their own bulletin board? Please include information on all necessary hardware and software and how to get it. I am also looking for a gaming BBS program, similar to the one on CompuServe, which would allow users to play computer games on-line (with graphics, if possible).

Gerald T. Madden
Bayville, NJ

To start a bulletin board, you need a modem with auto-answer capability. In addition to the Anchor modem mentioned above, the Hayes Smartmodem has this feature.

The best source for general information about starting and running a bulletin board is (naturally) a bulletin board. Two excellent BBS's are ACE in Eugene, Oregon (503-343-4352), and ABACUS in San Francisco (415-587-8062). —ANTIC ED

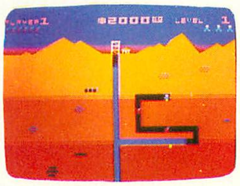
TURN YOUR HOME INTO THE HOTTEST ARCADE IN TOWN





O'RILEY'S MINE™

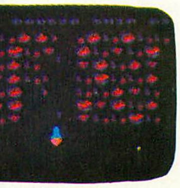
You're a mad Irishman digging your way through an abandoned mine filled with oil, coal, gold, rubies, diamonds—and hungry creatures. You'll need the luck of the Irish to survive, but with so much at stake, it's a chance you're willing to take.



O'RILEY'S MINE™ available for Atari®, Apple® and Commodore 64®

MOON SHUTTLE™

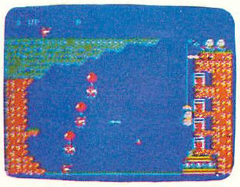
Your screen explodes with life-threatening action as you pilot your Moon Shuttle through outer space in this home version of the Nichibutsu® favorite. Awaiting you is The Prince of Darkness and his forces, which mysteriously multiply!



MOONSHUTTLE™ available for Atari®, Radio Shack Color®, Commodore 64®, coming soon for Apple®

POOYAN™

One of the biggest arcade game hits from Konami is a game of fast action in life-and-death encounters. You battle a pack of hungry wolves eager to catch your defenseless piglets. You'll need quick reflexes and a good arm in the new arcade hit from Datasoft.



POOYAN™ available for Atari®, Radio Shack Color®, Apple®, coming soon for Commodore 64®

ZAXXON™

Zaxxon has all the unique color graphics, super sound and unprecedented 3-dimensional effects that made it the star of the arcades. Maneuver your ship through the state-of-the-art defenses of the floating fortress to come face-to-face with the deadly Zaxxon Robot. This is the official home version of the Segas arcade hit.

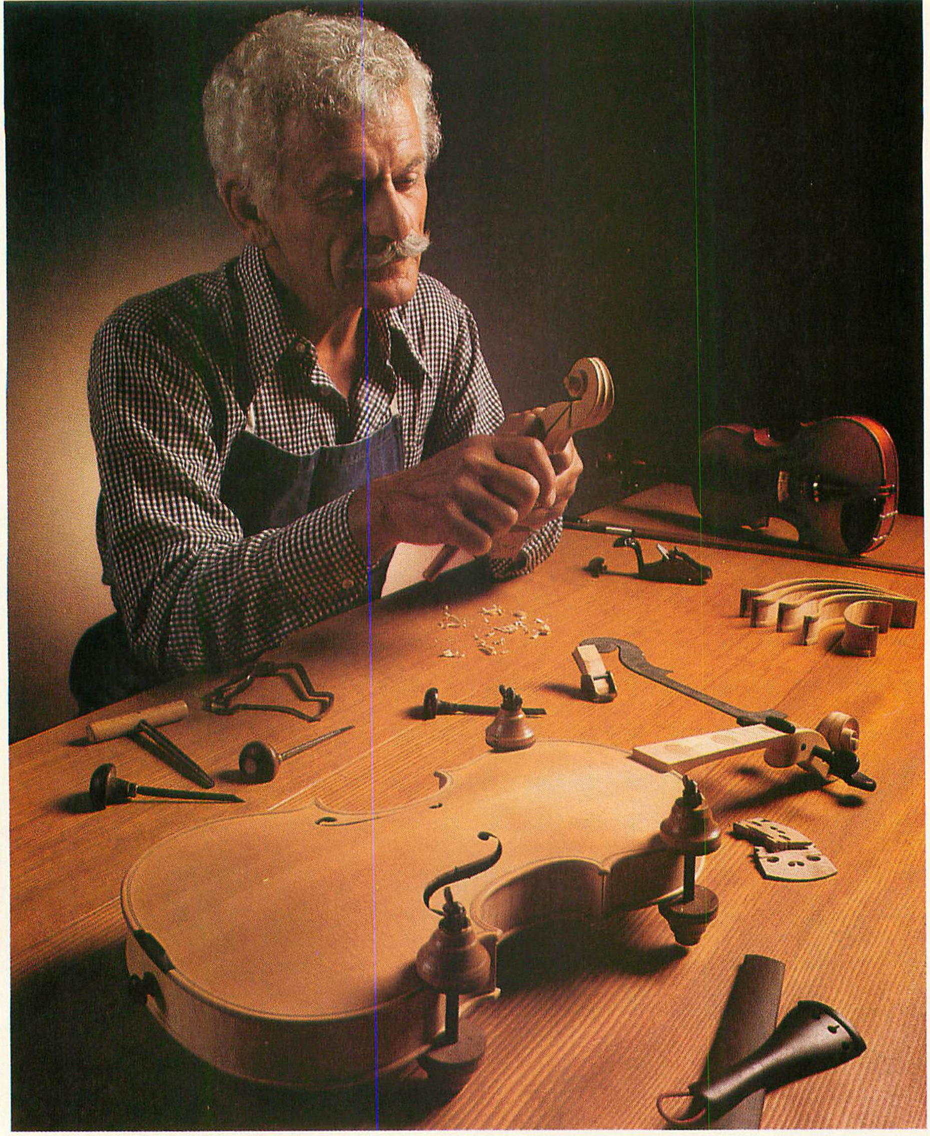


ZAXXON™ available for Atari®, Apple®, Radio Shack Color®

Our reputation as one of the premier game manufacturers assures you of the highest quality attainable in action, strategy and graphics. For the hottest titles in entertainment, keep your eye on the leader—DATASOFT.

You'll Find The Best In Home Computer Software from Datasoft®

9421 Winnetka Avenue, Chatsworth, CA 91311 (213) 701-5161



Craftsmen Need Precision Tools . . .
Programmers! Demand Precision Software!

At last! A revolutionary new language which dramatically alters the state-of-the-art in programming tools. **ACTION!'s** incredible speed and remarkable versatility make it the most powerful tool ever for Atari® computers. Since it is hundreds of times faster than Basic, you can even use it to write arcade action games.

A straightforward, easy-to-use language with a superb built-in screen editor that allows you to put the "bells and whistles" into your programs. **ACTION!** comes in a feature-packed cartridge.

See for yourself. Allow your creativity to soar with **ACTION!** Cartridge, tutorial, reference manual . . . $99.

OSS™
Precision Software Tools
1173D S. Saratoga/Sunnyvale Road
San Jose, CA 95129 · (408) 446-3099

Functional, honest, and beautiful describe the simple lines of a craftsman's tools. For the violin maker these tools are an extension of the human hand to better execute complex designs. For you, the programmer, Precision Software Tools keep complications out of your programming while allowing you to produce intricate programs.



See the complete collection of OSS Precision Software Tools!™

- MAC/65: The fastest 6502 macro assembler/editor package on cartridge . . . $99.
- BUG/65: A powerful debugger. On disk, with OS/A+ . . . $35.
- C/65: The first native mode "small c" compiler for Atari and Apple® computers. On disk . . . $80.
- BASIC XL: Twice the power and twice the speed of Atari BASIC in an easy-to-use cartridge . . . $99.

All products on disk include OS/A+ and also require 48 K.

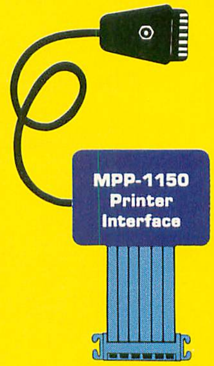
SEE YOUR LOCAL DEALER!

Call or write for informative brochures.

Let your Atari experience the MPP CONNECTION!

MPP-1150 Printer Interface

- Replaces Atari 850™ Interface Module.
- Compatable with all software (including Visicalc™, Text Wizard™, Filemanager 800™, etc.).
- 5 foot cable with Centronics plug (compatible with Epson, NEC, Prowriter, etc.).
- 2 year warranty.
- Connects to serial bus on computer.
- Supports serial printer with additional cable.
- Works on **ALL** Atari Computers.



New

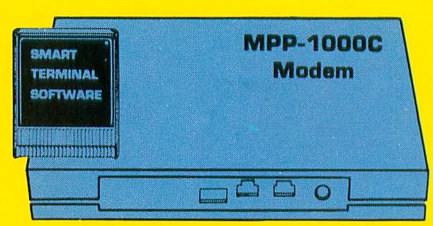
only
$99.95

MICROBITS PERIPHERAL PRODUCTS

MPP-1000C Modem

- No Atari 850™ Interface Module needed.
- Smart Terminal Software on Cartridge.
- Direct Connect to Phone Line.
- Connects to Joystick Port.
- Works on **ALL** Atari Computers.

Improved



Smart Terminal Features:

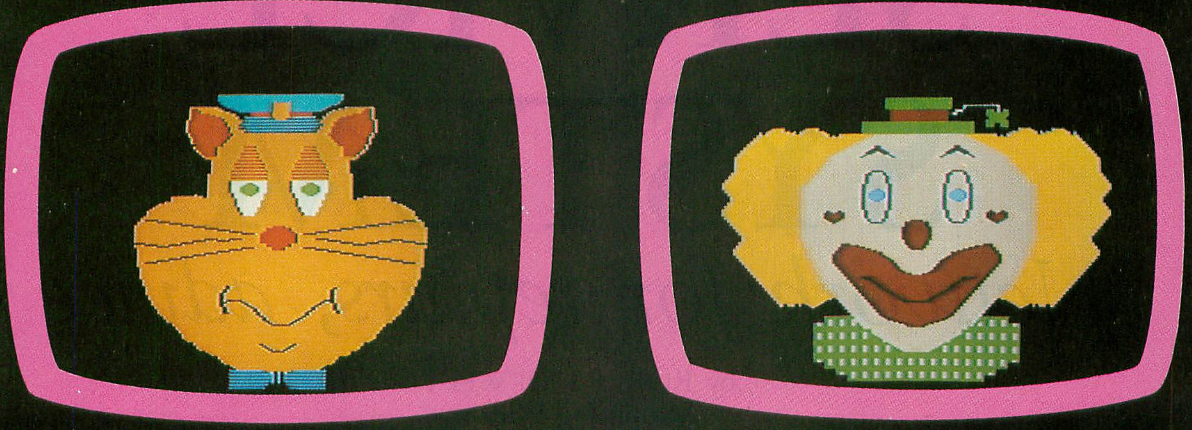
- Multiple Buffers
- Off-Line Editing
- Upload/Download of Text and Programs
- Full/Half Duplex
- Supports XMODEM Protocol
- ASCII/ATASCII Translation
- Allows Transfer of Files Larger than Memory
- Variable Baud Rate
- Parity Options
- 100% Machine Language

~~$199.00~~
new
low price
$149.95

MICROBITS PERIPHERAL PRODUCTS

225 W. Third Street • Albany, Oregon 97321 • **(503) 967-9075**

SOFTWARE MOVIES™



NEW!

SOFTWARE DESIGNS FOR DEVELOPING YOUNG MINDS™

MAXIMUS, Inc. is excited to present two new educational software movies for kids of all ages . . . and more are on the way!

STORYLINE™ makes bedtime, or anytime, a warm and friendly funtime. Clover the Clown is your tourguide for two fairytales: The Ugly Duckling and Rumpelstiltskin. Through computer magic you become a part of each story!

SAFETYLINE™ combines fun with important lessons about safety. Max the Cat shows you how to cross the street safely going to school and what to do when lost at the zoo.

Both software movies have interactive games that reinforce the fun and learning. Both have real human voices; you don't need a voice synthesizer!

Features of the software include:

- Sophisticated Face Animation
- Lip-Synchronized Voices
- Original Musical Scores
- Superior Full-Color Graphics
- Optional Joystick Control
- Machine Language Programs

Relax and enjoy yourself. Let Max, Clover, and their colorful friends guide you through a new world of fun and learning. You'll be amazed at how real they are!

STORYLINE™ and SAFETYLINE™ are currently available for any Atari computer with 48K. Each software movie comes in either CASSETTE ONLY ($29.95) or CASSETTE/DISK ($34.95) versions. Order by mail or phone. Visa and Mastercard welcome. Include $2.50 postage and handling; Virginia residents add 4% sales tax. Dealer inquiries invited. Write for our free catalog. MAXIMUS, Inc., 6723 Whittier Avenue, McLean, Virginia 22101.

ORDER TOLL-FREE 1-800-368-2152

MAXIMUS *...Where Excellence is the Standard*

Adventureline™ Series Coming Soon

SERVICE SYSTEM

Network for repairs, advice

by ROBERT DEWITT
Managing Editor

downtime. You won't find it in your Funk and Wagnalls, but the Microcomputer Dictionary defines it: "the period during which a computer is not operating correctly because of mechanical or electronic failure." The definition should include operator ignorance and software defects. Whatever, few things are as frustrating as a computer that won't do what you think it should.

When this occurs, what do you do? Being an intelligent and well-intentioned ATARI user you will try to solve the problem yourself, but being unfamiliar with the many things that can go wrong, go wrong, go wrong, . . .

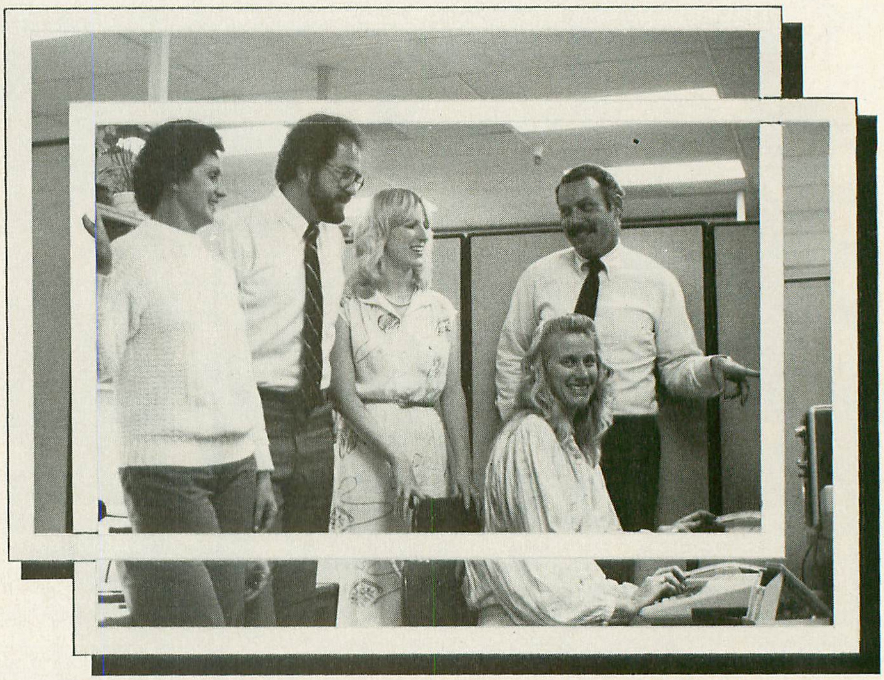
You call the dealer. If the computer is within warranty, the dealer may be able to help, or if the store is a "servicing" dealership, repairs may be undertaken on the premises. Otherwise, let your fingers do the walking.

In the United States, the telephone Yellow Pages now list more than 1,700 establishments qualified to fix your ATARI. For more than 90 percent of you, that place will be no further than 15 miles away. This is no accident. Atari has worked hard to establish what it considers the finest service system in the microcomputer industry.

Some of the elements of that system are:

• an international network of trained, qualified repair personnel

• a low-cost service contract available to owners after the expiration of warranty



Left to right: Darlene Souders, 800 Operator; Dave Wilson, Manager Customer Support Service; Cassie Stahl, Training Specialist; Jane Sokolow, Product Specialist; Robert Levrini, Supervisor Product Specialist Group.

• two Atari-operated repair facilities (Somerset, NJ, and Sunnyvale, CA)

• a staff of 70 customer-support employees, including 25 Agents and 15 Product Specialists who respond to more than 600,000 toll-free calls and 250,000 mail inquiries a year.

"My job is to keep ATARI Home Computer systems up and alive, at a minimum of cost to the company. That's it in a nutshell," says Jon Ebbs, Vice President of Consumer Product Service at Atari.

ANTIC visited with Ebbs and members of his service group to get a better idea of that side of the company. This is what we discovered.

"Service is always a problem when you have high-technology products," Ebbs explains. "Especially when you have inexperienced users. At first Atari only had to support the game machines. That was relatively easy. Only a few things could go wrong, and the fixes were simple.

"Then the computers came along and everything changed. Problems were more common and more complex. At first we relied on our retail outlets — mostly computer stores — for repairs and service, but that didn't work. Many

of them weren't capable, and most of them weren't interested in service. Then our marketing plan began to switch from specialty shops to mass outlets where the sales people many times knew less than the customer. We had to do something.

"I joined Atari in May, 1981. By August we had identified about 500 service facilities that could meet our requirements. In January, 1982, John Cavalier (President of Atari Products Company) chartered us to support the computers. I assigned Jim Prather, Director of Field Service Operations, to seek out, sign up and train service people in appropriate locations throughout the U.S. and abroad. That was just a little over a year ago, and now we've got the most extensive service organization in the industry.

"Commodore has virtually no customer support.

"Apple owners must go to Apple dealers.

"TRS machines have to be repaired in one of about 300 Radio Shacks.

"TI's I think you have to take to Texas.

"No one else provides toll-free phone advice. We've got 36 incoming lines for our toll-free numbers. Why, the phone bill for that alone was $1.5 million last year."

Jon Ebbs gets involved in his work.

He also points with pride to the work of John Hahn, Director of Technical Support. Hahn's group prepared Atari's comprehensive service manuals for training and reference. "They aren't texts exactly," Hahn says, "they are diagnostic, problem-focused. Isolate the failure by differential identification of symptoms, eliminate the impossible or improbable, confirm the probable breakdown, replace the part or module with minimum time and cost, verify correct functioning. That's the technique."

The establishments chosen as service centers must qualify with Atari as ethical businesses with at least one repair person qualified for training. Usually these are experienced electronics technicians for whom the two-and-a-half-day Atari training sessions give information specific to the Atari equipment.

Hahn's group is available to authorized servicers, again by a toll-free number. Sorry, neither these manuals nor the number are provided to customers.

But customers *are* being encouraged to make some repairs on their own. Soon you should be seeing Atari Service Repair Kits on sale where Atari equipment and service are offered. These kits are coded for difficulty, and show the tools needed.

Our visit to Atari concluded with a tour of the Customer Relations Department. Dave Wilson, the manager, guided us through the cubicles where his staff receives toll-free calls from 7 a.m. to 11 a.m. and noon to 4 p.m. Pacific time each weekday. These Agents are continuously trained to answer questions about the many Atari products. The average call lasts three minutes, and the Agent we spoke with said she answers about 200 calls each day. Average waiting time for a free Agent is about one minute.

For questions beyond the Agent's knowledge, a Product Specialist is usually available on-line. If not, a written request for follow-up and call-back goes to the staff of Product Specialists, each of whom is expert about a certain group of products.

The toll-free numbers for this service are 800-538-8543, or 800-672-1404 for California residents.

CHEMICAL WOULD LIKE TO OPEN A BRANCH IN YOUR LIVING ROOM.



At Chemical, we've figured out a way to provide banking with all the comforts of home.

ANNOUNCING PRONTO.® THE HOME BANKING SYSTEM.

Pronto offers money management and banking services 24 hours a day at home. At your convenience. Not ours.

With the help of your personal computer, TV and telephone.

You can check your balance, or check which checks or deposits have cleared. And automatically reconcile your checkbook.

Pay bills to over 350 different merchants and services. Without writing a check or buying a stamp.

Or transfer money from one account to another.

A feature called electronic mail can answer all your banking questions by putting you in direct contact with our Customer Service staff.

What's more, Pronto's budgeting system allows you to plan and control your finances while keeping track of all your expenses.

And no matter what kind of business you conduct on Pronto, it's strictly your business. You'll be the only one with access to your financial information.

CALL US OR COME IN FOR A DEMONSTRATION.

Call us toll free at 1-800-782-1100, or come to one of the Chemical Bank locations listed below. It might be the last time you come to the bank.

Pronto

THE HOME BANKING SYSTEM FROM CHEMICAL BANK.

MANHATTAN: 100 World Trade Ctr., 756 B'way, 2 Penn Plaza, 277 Park Ave., 1350 Ave. of the Americas, 377 Madison Ave., 11 W. 51st St., 622 W. 168th St.
LONG ISLAND: 410 Northern Blvd., Great Neck, 350 Main St., Huntington, 10 N. Village Ave., Rockville Centre
B'KLYN: 50 Court St. **QUEENS:** 107-36 71st Ave., Forest Hills **WESTCHESTER:** 676 White Plains Rd., Eastchester, 222 Mamaroneck Ave., White Plains

WIZARD AND THE PRINCESS

Computer Fantasy Comes True

by ROBERT DEWITT
Managing Editor

California state route 49 is a special road. From north to south it connects the towns along the veins of gold that caused the rush of 1849. At its southern end you find Coarsegold, still (or again) a bustling western town with a country feeling. Coarsegold is experiencing a new "rush" today, as bright young programmers and other creative hopefuls gravitate there to Join Sierra On-Line — a software development company, no less.

Sierra On-Line is in Coarsegold mainly because of the dreams of Roberta Williams, the diminutive wife of the company's president and founder, Ken Williams. She loves these mountains, and saw the nascent software industry as the steed to carry her there, far from the congestion of the Los Angeles basin where she grew up. She designed a computer adventure game, called **Mystery House**, *which her husband programmed, and it became the first in a line of SierraVision products that now numbers about fifty. All those titles aren't hers, of course, but several are, among them Atari titles such as* **Wizard and the Princess** *and* **Dark Crystal** *(based on the movie by Jim Henson).*

Sierra On-Line has flourished in Coarsegold since moving there in 1980. It now employs 110 people and expects to gross $20 million in 1983 from the sale of products for the ATARI, Apple and IBM computers. ANTIC became interested in Roberta especially because she is a woman succeeding in a man's



world. Programmer she is not, nor does she try to be. By her own description, she is a "story-teller," a writer who happens to put her stories in game form; she even resists being called a game designer.

The fantastic success of Sierra On-Line parallels the fairy tale aspects of Roberta's own life — that of a dreamy loner drifting towards a conventional future, then rescued by a computer wizard and whisked off to a castle in the far-off mountains.

The Williams have two sons, Kenneth Eric and Christopher.

ANTIC: I know that you and your husband were originally from Los Angeles and got involved in software through distribution of some of Scott Adams' products. Then you sold off your distribution business to what became Softsel.

WILLIAMS: Yes. We sold it to a good friend because we needed the money to start On-Line.

A: Did your intention to move to a place like this have anything to do with your decision to stop working in distribution?

W: I think so. In the back of my mind, when I was writing *Mystery House*, I kept thinking, "This is going to get me to the mountains." I knew that we could be anywhere in this business, as long as UPS is around!

A: Why did you want to go to the mountains? Are you a country girl?

W: Sort of. I grew up in the San Gabriel mountains, in a little town called LaVerne, on a couple of acres of land. Then I got married and we moved to the city, and had apartments and houses. But I never felt at home. I always felt like I wanted to go back.

A: When you were a young girl, were there interests, games or books you read that influenced what you're doing now? That you find coming out in your work?

W: Yes. I hate to say though, because it sounds so dumb: fairy tales. I read the Green Book, the Blue Book, the Brown Book, the Gold Book . . .

A: Are they by different authors?

W: I don't even remember. Probably a lot of them are the same old fairy tales, just rewritten. I was also interested in anything that had to do with magic, or fantasy, like the *Wizard of Oz* or *Alice in Wonderland*. I always read a lot and fantasized a lot. I was always a story-teller. I used to tell my friends and my cousins stories, and I used to get in trouble for it.

A: Well, it must be very pleasing to you now to be able to make your living by doing what you've always wanted to do.

W: I don't know what writers or movie

producers or directors were like as kids, and I never went to college to learn any of this. But I've always done it, in one form or another. I was a loner as a kid; that's one reason I moved up here. I didn't have a lot of friends, so I had to create my own fantasies, because I didn't like who I was. Not at all.

A: What do you like about yourself now, more than before?

W: I feel that I've grown as a person. I can deal with people; I can talk to them without feeling shy. I know my own mind now; I'm not floundering around in a world in which I don't quite fit. I feel I can create a world to be how I want it to be; and not just in games. I feel that I can have a direct impact on what this industry becomes — and this company. I feel in control.

A: Are you really interested in influencing what this industry becomes?

W: Yes, a lot.

A: Why?

W: My goal is to create the ultimate story. I want to make people so involved that they will feel they're really there. This has never been done with movies, books, or games, but I think that ten to twenty years from now there will be "something" I can create that will provide the ultimate in experiencing a story. I don't know what it will be. But I like the fact that I can change the entertainment media. That excites me.

A: Looking into your crystal ball, ten years down the line, what do you think might be one of the possible mediums for this ultimate kind of storytelling?

W: It would involve a combination of things. It would involve computers, of course, and video. Not computer graphics — video. It would be a game, a story and a movie, call in one. And maybe a book. Right now, with adventure games, you try to get people involved. What you can't do now with a movie or book is talk to it, direct it, or guide it in any way. But you can do that with an adventure game. So it would probably be some sort of movie that you can guide.

A: Do you think this kind of thing could have a dehumanizing or desocializing effect on people?

W: I don't see how. People can't just stop their lives to play games or be involved in stories forever. They have to work. You can't get away from everyday responsibilities. In a way, it might have good effects, because it takes people away from their problems. I don't see how it could hurt.

A: To what extent are you willing to introduce elements into your stores that display the evil or malice in the villain; the other side of the coin?

W: Well, so far my games have been pretty soft. They're not much worse than a Walt Disney movie. Disney movies have bad guys, but the good guys always win. And in my games, there's no gore or blood or anything like that, and the good guys win, or at least I hope they do. You make it hard for the players to win, but you really hope they do, and you give them some sort of positive feedback when they do. It's a classic story; you have to have the good guys vs. the bad guys. There's no way you can get away from that. And people get real satisfaction when they win. It tells them, "See, good always conquers evil."

A: You believe that personally?

W: Uh huh.

A: Are you religious?

W: No.

A: Do you think of yourself as spiritual?

W: No. Just realistic.

A: Do you see your games as a vehicle for expressing social or moral values?

W: Yeah, though I never really thought about it till now. Things I put in my games or stories do reflect, very much so, how I feel in general and how I would solve something, and what I think is right or wrong. I don't have people solving anything in a devious way, or . . . well, there have been a few instances . . . where you can break into a house, get something and take it out, but I've always felt very guilty when I do that. I know it bothers kids to do something they've been told by their parents not to do. Then, they'll ask their parents, "Hey, how come I can break into this house? That's not my house." So, you try to think that way. I do, even though I have done it a few times.

A: Do you see children as the primary audience for your games?

W: I don't write for any age group; I write for everybody. I guess they should be at least nine, or be able to read. They should have common sense and creativity. I really think that kids have more creativity than most grownups. It's not the creativity that stops kids; it's just not being able to understand things, but I don't think of any age group or sex. I think of what pleases *me*. If it makes me happy, then I'm not worried about it at all and I feel please with what I did.

A: To what extent do you need to understand computers, to do what you do?

W: I can look inside a computer and not understand a single thing. I don't know where to put the cards or what half the keys do, but I do understand the limitations of a computer. I understand what it can and cannot do. I don't know why; I've just always been able to. I conceive of a game and I know how far I can go with it. I can design it and show it to a programmer, and be told, "You can't do that." Then I'll say, "Yeah, I think we can. Let's think about this." So we sit down, and I always get my way. That's the thing with me — I always push to the limit. I think it's been an advantage not knowing how to program and being a designer, because I'm not bogged down by the technicalities.

A: We usually ask our interviewees if they have any advice for young people who are hoping to get involved in software development and other computer occupations. Do you have anything to say about this in general, and do you have anything special to say to girls?

W: I'm the kind of person who doesn't recommend that anyone get involved with anything they don't feel comfortable with. If you don't like programming, you shouldn't do it, because you won't enjoy or be good at it. However, it is true that the computer industry *is* the industry of the future. And there are many aspects of the industry besides programming. There's design, which is totally different from programming — totally different. There's marketing. And, of course, we have all the various departments — sales, legal, etc. — just like any other industry. Now, for girls,

I would recommend that they at least try to program. Try to get to know the computer and to feel comfortable with it. If it doesn't work out, that's okay; at least you tried.

A: In your work you come up with the creative context of the game, which will then be programmed by other people. You call that writing, designing. Do you ever think, "Gosh, I wish that when I was in high school I had done this better or taken that course or tried this life experience?

W: If I had known what I know now, I would have definitely taken some writing courses.

A: Do you think that might have spoiled your approach?

W: No, it would have made me much better. And I would have taken art and film, because my ultimate goal is to be a film director and producer. But I do the best I can with computer games.

A: You went to school during a period when drugs were used frequently. Did you ever use drugs?

W: No. I smoked cigarettes and I drank (laughter). I was close to starting, though. I started running around with the bad kids. You know, the kids who sat around outside school, and smoked cigarettes, and ditched classes, and went to continuation school. I was very rebellious, but I didn't get into drugs. But, I was very close. And then I met Ken. We were still teenagers and he was very straight, very responsible. He worked from the time he was twelve, and was really good at whatever he did. And I was this teenybopper, had no idea what I was going to do with my life, didn't want to go to college, and didn't want to do anything but party. He's really gotten me away from that kind of attitude. He pulled me out when I was ready to go downhill.

A: Do you think of your life as a fairy-tale?

W: Yes. Well, it has been especially over the last few years. How many people did you know in school who had no ambitions, didn't know what they wanted to do? I never did any homework. I managed to get through school with decent grades, but I never tried. I didn't want to go to college and I didn't want to join anything. I didn't want to participate. I was lazy, basically, very lazy and confused. Then I met Ken, and for the first six years of our marriage I just had kids and took care of the house, and then look what happened to me. I didn't even ask for it, it just came. All of a sudden you discover something that you know how to do, something you never realized before.

A: To a certain extent, the opportunity for you to express your talent has been kind of an artifact of your husband's prowess with computers and the growth of the computer industry itself. Without those two factors having come together in your life, do you think you would be involved in attempting creative work at this stage of your life?

W: No, not at all. When I was a kid, this was what I wanted to do. I wanted to be a writer. I used to talk about it a lot. But my teenage years were very bad. When I was a teenager, I changed. Everything had to be "normal." Everything had to be rebellious. And I forgot, I forgot what I wanted. As a kid, I used to talk about being a movie director, or getting into film, or becoming a writer, and then I forgot about it for years and years and years. And then the adventure games brought it back. One night it just hit me and everything came back from when I was a kid.

A: This was before Sierra On-Line. You began to get the notion that you could write a story that could be played on the computer. This was before adventure games had really hit?

W: Yes. In fact, **Colossal Cave** made my life. At the time, Ken programmed a computer in LA, a big IBM. He used to bring home a terminal every night. The computer had games on it, and one of them was something called Colossal Cave. We played it at home, on the terminal. But, we didn't have a monitor; we used a printer.

A: And then you decided to write *Mystery House*. How did that come together? Did you say, "Gee I could do that?"

W: Yeah, that's what I said.

A: Do you think of your style and techniques as proprietary business information? Trade secrets?

W: No, I'm not into trade secrets. I'm not like that. But a lot of people in this industry are. Too many. They just won't tell you what they're doing. That's one reason I don't really know what they do. And I'd tell *them* — in fact, I *have* told them. But as far as programming techniques go, anybody can do it. It's nothing special. The specialness comes from the stories I make up, and nobody can do that but me. They can do it their way, but nobody can do it my way.

A: *Frogger* has been a phenomenal seller, on the top of the Softsel charts for a long time. What do you think it is about *Frogger* that makes it so popular?

W: It's cute. No "shoot-em-ups." It was one of the first cartoonish-type arcade games, as opposed to the shoot-em-ups. Like **Donkey Kong**, **Pac-Man**, **Popeye**, and **Congo Bongo**. *Frogger* was one of the first of those cute ones, and that attracted women. I really think women have a lot to do with this.

A: What do you think of the ATARI as a machine? Obviously, you've been in the Apple world for a long time. Do you ever personally use the ATARI, or play your games on it?

W: I like the ATARI better as far as graphics. It's funny, though, that the graphics for adventure games don't look as good on the ATARI as they do on the Apple, but the ATARI graphics are *much* better than the Apple when it comes to arcade games. And the sound — there's no comparison. As a game machine, ATARI is just much, much better than the Apple.

A: Is there anything that we haven't talked about that comes to mind as being important to you at this time?

W: I want to continue doing what I'm doing and to keep our company going so that I can do what I do, and continue to be innovative. I hope that I don't run out of ideas. The toughest part of my job is to be better each time, and to come up with something new, and to continue challenging people.



WE'RE VERY HARD ON OUR SOFTWARE

You might even say we're perfectionists. Because at Softsmith,™ we give our software the hardest workout, the toughest testing, the most rigorous evaluation. The result is software that has earned our confidence, and will justify your trust.

In particular, we do three things that make Softsmith software the most dependable you can buy.

1.

We're picky. Out of the hundreds of programs Softsmith evaluates every month, we choose to publish very few. A lot of good programs are rejected; but we think you can't be too picky when it comes to personal computer software. Our selectivity is your best assurance of quality.

2.

We complain a lot. If you were a programmer, and Softsmith accepted your program, you would have a right to be proud. But you shouldn't go on vacation yet. Because no matter how good that program may be, Softsmith evaluators will suggest some improvements; politely, but firmly. We may complain a lot, but people thank us later.

3.

We insist on plain English. After we've made the best program better, we're still not finished. Because we know that even the best program is no good if it's too hard to use. So we put a lot of time and effort into translating our instructions from computerese into plain English.

We publish software you can trust. Yes, we pick our programs carefully. And complain a lot to make them better. And insist on plain English instructions. The result is a library of personal computer software you can depend on. Even if you don't know a Pascal compiler from an emulation subroutine.

Softsmith has programs you can trust for all the most popular personal computers. Programs for Education, Home Management, Entertainment, Word Processing, Business, Communications and Programming. Ours is the largest library of quality software under one brand name.

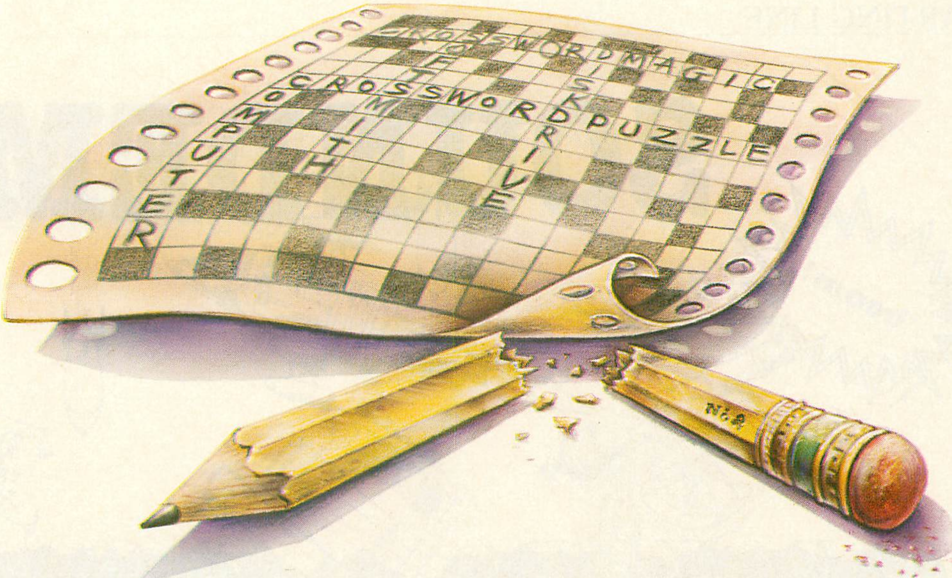
So before you choose a software package for your computer, make sure someone's taken the time to be hard on it. Make sure it's Softsmith, the software you can trust.

Ask for Softsmith brand software wherever computers or software are sold. Or call us TOLL-FREE at **(800) 341-4000** for the name and location of your nearest dealer.

Softsmith Corp., 1431 Doolittle Dr., San Leandro, CA 94577. A company of The Software Guild.™

SOFTSMITH™

SOFTWARE LIBRARY



CROSSWORD MAGIC™ A GAME DESIGNED TO GET YOU DOWN (AND ACROSS)

What's a five-letter word meaning report? The capital of a Baltic country, 6 letters, starts with W? If these questions get you thinking, you've obviously got the crossword bug. There is no cure, but Crossword Magic, from Softsmith™ Corporation, is just the treatment the doctor ordered. It is a challenging, intelligent game that will help you improve your vocabulary while you're having fun.

With Crossword Magic, you create your own puzzles to challenge your friends. First you choose a topic; then you enter words using the keyboard. Crossword Magic automatically fits the common letters together to form a familiar crossword grid. If there is no opening for the word you enter, the program saves it and fits it in later.

Next comes the fun. After the puzzle is full, Crossword Magic prompts you for a clue to go with each word. Make your clues as obscure, humorous or serious as you want. You can save the puzzle and clues on disk for later play on the screen, or have them printed out to send to friends.

Crossword Magic runs on the Apple® II, II + and IIe; Franklin Ace™ and Atari 800® computers with 48K RAM. A disk drive is required; printer is optional.

More than just a game, Crossword Magic is also an excellent educational tool for helping children of all ages improve their spelling and vocabulary skills. It is one of the programs in the Softsmith library of quality software — the largest library of programs under one brand name.

Softsmith has the most thoroughly tested, refined and clearly documented brand of personal computer software you can buy. You can depend on Softsmith programs for Education, Home Management, Entertainment, Word Processing, Business, Communications and Programming. And we back them with our Toll-Free customer service number.

Ask for Softsmith brand software wherever computers or software are sold. Or call us Toll-Free at (800) 341-4000 for the name and location of the dealer nearest you.

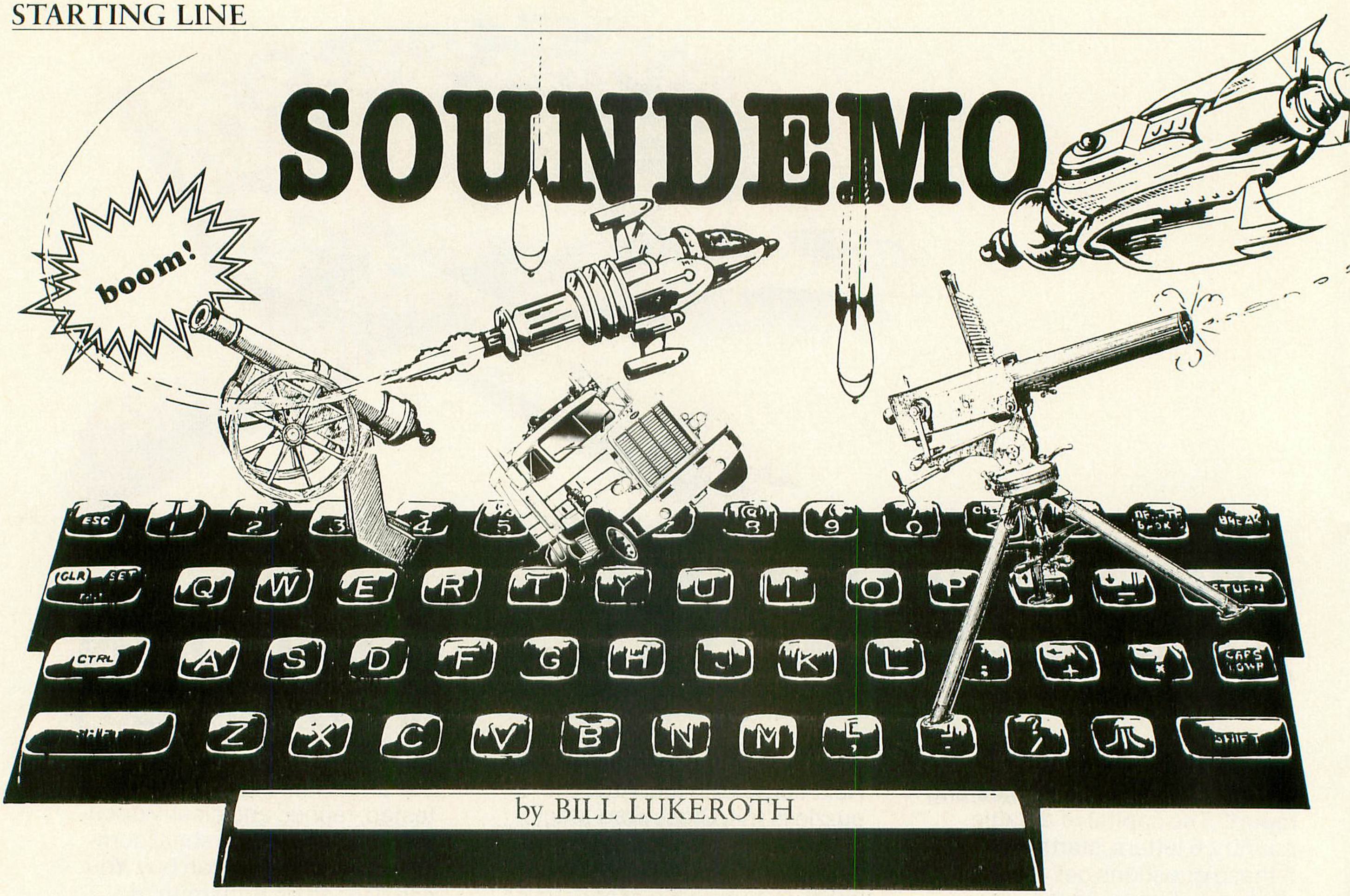
Dealer inquiries are invited.

Apple II, II + , and IIe are registered trademarks of Apple Computers, Inc. Franklin Ace is a trademark of Franklin Computer Corp. Atari 800 is a registered trademark of Atari, Inc.

SOFTSMITH™

SOFTWARE LIBRARY

SOUNDEMO



by BILL LUKEROTH

One of my favorite ways to relax after a hard day of groveling at the altar of Commerce is to play with the SOUND command on my ATARI, and as a result I've built up a small library of sound effects. **SOUNDEMO** is a collection of the more useful ones, which you can incorporate into a game "as is," use as a learning tool, or just play with.

When you run SOUNDEMO, the first thing you'll see is a menu of sound effects; make your choice by typing the appropriate letter. *Don't* press [RETURN]; it isn't necessary. Depending on which one you've chosen, either the sound will start up immediately or you'll be prompted to press the joystick button (the program requires that you have a joystick plugged into Port 1). Some of the selections return to the menu automatically; to terminate the others you'll need to press [START] (any necessary instructions will be displayed on the screen).

THE SOUND EFFECTS

A. The sound of a rocket blasting off.

B. I think this sounds like the engine room of a space ship, but it could be used for many other things as well.

C. It's a toss-up whether this sounds more like a "space" machine-gun or a *real* machine-gun; see what you think.

D. Technically, this should be called "diesel truck air horn," but you can fit only so many letters onto a Mode 1 line.

E. A classic space battle sound effect.

F. The sound of a bomb falling and exploding.

G. A multi-purpose droning sound, which reminds me of a racing car. It can also be used as a nerve-racking background noise (to increase tension during a game), or as a buzzer.

H. A cannon firing. Note that the routine that produces this sound is identical to E, except for the distortion setting. The enormous difference in the sounds produced, caused by changing one variable, gives you some idea of the power of the SOUND command.

I. In the science fiction movies of the '50's, a stock scene was a shot of a computer digesting data; the computer would blink a few hundred lights in a random sequence and then spit out enough punch cards to pave a parking lot, making strange noises all the while. I can't arrange to have punch cards fly out of your joystick ports, but this sound is a faithful representation of the one heard in the old movies. The barely audible rising tone in the background is used to create the subconscious impression that the computer is moving toward a solution, rather than simply making random noises.

J. and K. I've left these two blank, so that you can add your own favorite sound routines if you like. The subroutine for J must start with line number 1000 and extend no further than 1099; the sub for K must start with 1100 and end before line number 1199.

To make things a little more interesting, the text changes color each time the menu is redisplayed; the color is determined by your previous selection, via the SETCOLOR command in line 50. You might also find line 85 interesting;

although any computer will allow you to GOTO a line number ("GOTO 100"), and many will allow you to GOTO a variable ("GOTO X"), ATARI is the only computer I know of that allows you to GOTO an expression ("GOTO X*Y + C/M" is a ridiculous, but perfectly legal example).

Those of you new to computing will be interested in some of the programming techniques used in the listing. In line 20, the string "Press START to Quit" is a prompt invoked in several places. In line 220, for example, if a PEEK at location 53279 does not reveal the value of six, the sound generated by line 200 simply continues. Location 53279 monitors the [START] button, and the value of six there means [START] has been pressed, which allows the program to proceed beyond line 220.

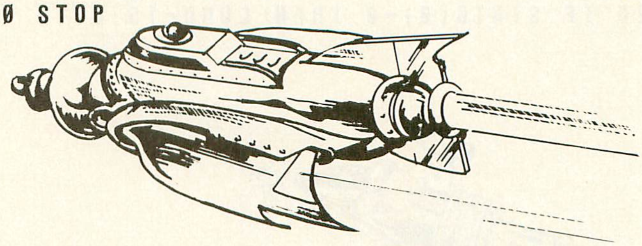
Line 40 "opens" the keyboard as an input device. The program expects a GET, as in line 70, and when a key is pressed the computer gets the ATASCII value of the key. These values are listed in your *Atari BASIC Reference Manual*, but you will find that the values for "a," "b," "c," etc., are sequential from 65. That is why, in line 70, Q is defined as Q-64. Subtract 64 from 65 and you get one, while 64 from 66 yields two, etc. In this way, Q becomes a series of integers beginning with one. Then, in line 85, there is a GOTO Q*100. This multiplication identifies the group of lines that makes the various sounds.

Looking again at line 40, note the TRAP 2000, then look at line 2000. These simply catch any inappropriate keypress (one that doesn't produce a value for which there is a sound) and return the program to the menu.

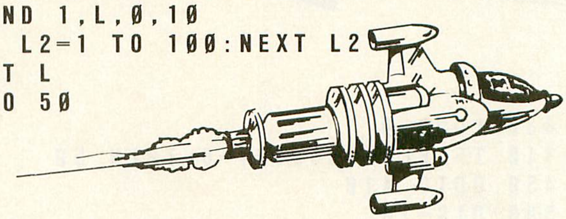
For *really* high quality sound, connect your computer to your stereo with the "Ultra Sound" cable featured in the February 1983 issue of ANTIC. If you haven't already built one, don't drive yourself crazy looking for PVC cable — just cut off one end of a standard stereo jumper cable (the kind with an RCA phono plug on each end), and solder the DIN plug on. I did and it works fine.

With or without the cable, one thing is certain: the more you use SOUNDEMO, the more you'll become convinced that buying an ATARI was a "sound" investment.

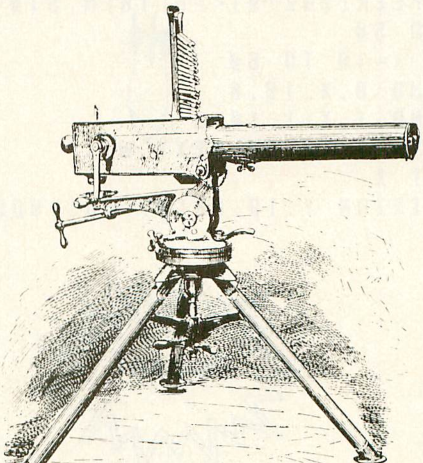
```
10 REM +++++++++ SOUND DEMO +++++++++
20 DIM S$(20):S$="PRESS START TO QUIT"
30 DIM TRIG$(20):TRIG$="PRESS JOYSTK B
UTTON"
40 OPEN #1,4,0,"K:":COL=5:TRAP 2000
50 SOUND 0,0,0,0:SOUND 1,0,0,0:GRAPHIC
S 1+16:SETCOLOR 0,COL,2:? #6;"CHOOSE O
NE:":? #6:? #6;"A.BLAST-OFF"
60 ? #6;"B.ENGINE R00M":? #6;"C.SPACE
MACHINE GUN":? #6;"D.DIESEL HORN":? #6
;"E.LASER GUN"
65 ? #6;"F.BOMBS AWAY!":? #6;"G.RACE C
AR":? #6;"H.CANNON":? #6;"I.THINKING C
OMPUTER":? #6;"J."
68 ? #6;"K.":? #6;"L.END"
70 ? #6:? #6;"ENTER SELECTION(A,B,C,ET
C.)"::GET #1,Q:Q=Q-64:COL=Q*2
80 GRAPHICS 1+16:IF Q>2 AND Q<6 OR Q=8
 THEN ? #6:? #6;TRIG$:? #6:? #6;S$
85 GOTO Q*100
90 STOP
```



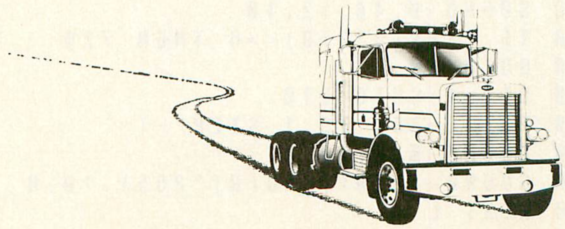
```
100 FOR L=60 TO 1 STEP -1
110 SOUND 1,L,0,10
115 FOR L2=1 TO 100:NEXT L2
120 NEXT L
130 GOTO 50
```



```
200 SOUND 0,40,4,10
210 ? #6:? #6;S$
220 IF PEEK(53279)<>6 THEN 220
230 GOTO 50
300 LOUD=0:REM machine gun
```

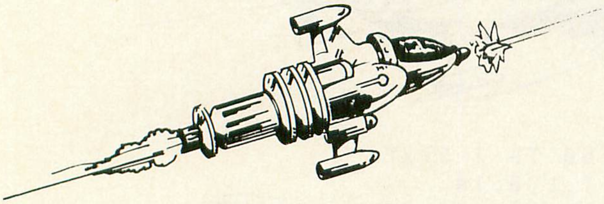


```
310 SOUND 0,255,2,LOUD
320 IF STRIG(0)=0 THEN LOUD=14:GOTO 34
0
330 LOUD=0
340 IF PEEK(53279)=6 THEN 50
350 GOTO 310
400 LOUD=0:REM diesel horn
```



continued on next page

```
410 SOUND 0,25,12,LOUD:SOUND 1,27,12,L
OUD
420 IF STRIG(0)=0 THEN LOUD=15:GOTO 44
0
```

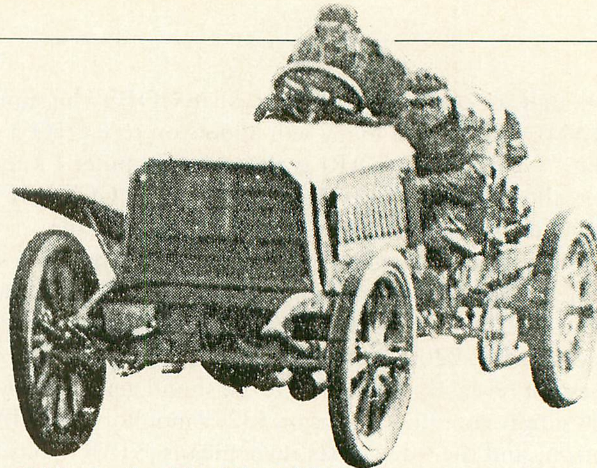


```
430 LOUD=0
440 IF PEEK(53279)=6 THEN 50
450 GOTO 410
500 DIS=10
510 IF STRIG(0)<>0 THEN 560
520 FOR L=0 TO 75
530 SOUND 0,L,DIS,10
540 NEXT L
550 SOUND 0,0,0,0
560 IF PEEK(53279)<>6 THEN 510
570 GOTO 50
600 FOR X=10 TO 60
630 SOUND 0,X,10,8
640 SOUND 1,X+1,10,8
650 FOR W=1 TO 50:NEXT W
655 NEXT X
659 POSITION 7,10:PRINT #6;"BOOM!"
```

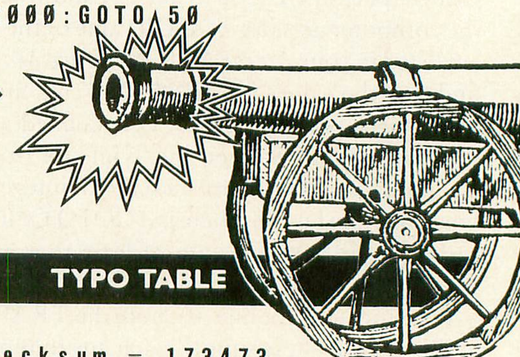





```
663 FOR L=10 TO 0 STEP -1
665 SOUND 0,250,1,L
666 SOUND 1,100,8,L
667 SOUND 2,25,3,L
670 FOR Y=1 TO 200:NEXT Y
680 NEXT L
690 GOTO 50
700 ? #6:? #6;S$
710 SOUND 0,40,12,10
720 IF PEEK(53279)<>6 THEN 720
730 GOTO 50
800 DIS=4:GOTO 510
900 FOR L=255 TO 1 STEP -1
920 SOUND 0,L,10,3
930 SOUND 1,INT(RND(0)*255),10,8
950 NEXT L
960 SOUND 1,1,10,8
```



```
970 FOR L=1 TO 50:NEXT L
980 GOTO 50
1200 END
2000 TRAP 2000:GOTO 50
```



TYPO TABLE

Variable checksum = 173473

Line num range	Code	Length
10 - 65	FB	587
68 - 210	FK	431
220 - 430	FF	360
440 - 630	YO	283
640 - 700	HE	312
710 - 1200	AY	311
2000 - 2000	XK	23



NEW LISTINGS FORMAT

Beginning with this issue, all program listings in ANTIC will use a monospace typeset font. Listings now appear in the magazine exactly as they will on your monitor or TV screen. Each line breaks at 38 characters, and each character in a line, including the blank, occupies the same amount of space as any other character. Thus, you can determine how many blanks to type in a given line by comparing it with the line above or below. In cases where such a comparison might be difficult, we will continue to specify the number of blanks.

HERE'S LOOKING AT YOU, S.A.M.!

Software voice without screen blanking

by JERRY WHITE

This article, along with sample program listings, will show you how to use S.A.M. with the lights on and how to display text in Graphics Modes 6 or 22.

Software Automatic Mouth (S.A.M.) is a product of Don't Ask Software. S.A.M. uses ATARI's sound capability to create speech through software only. You can put speech into your own programs for $59.95. You can also purchase programs that have S.A.M. built into them.

I was one of the first to purchase S.A.M., and I used him in a commercial product called **PokerSAM**. Since PokerSAM has been on the market, I have had many people tell me that they enjoyed the strange personality of their poker playing opponent. The vocal commentary is what makes the game fun. But many also commented disparagingly about the blanking of the screen when S.A.M. speaks. Although it didn't bother me, it does bother some people.

I discussed this problem with Bob Freedman and Randy Simon of Don't Ask, and found out why it was necessary to disable interrupts and blank the screen. S.A.M. tends to growl when the screen is on because he does not like to be interrupted. The ATARI computer's sophisticated display and interrupt system causes the machine cycles to be stolen from the 6502 microprocessor and S.A.M. wants the 6502 all to himself.

When the folks at Don't Ask contacted me about writing a spelling game using S.A.M., I thought it was a great idea. After all, how could you ask someone to spell a word without using speech? You certainly can't put a word on the screen and then ask someone to spell it. S.A.M. is perfect for the job, or almost perfect; there was still that problem of the blank screen during speech.

By the time you read this article, **Chatterbee** (the spelling game) will have proved that S.A.M. does not have to turn out the lights when he speaks. I'm sure that many S.A.M. users will want to learn how to do this in their own programs. My thanks to the folks at Don't Ask for their permission to publish this technique, and to Bob Freedman for the contribution of his Mode 6 display subroutine.

Jerry White is Technical Consultant and regular contributor to ANTIC. His programs are available from several software companies, notably Adventure International and Educational Software.

To make S.A.M. speak with the lights on we must give him a few POKEs in the side so that he won't growl, make maximum use of Player/Missile graphics, and limit our display list to low and medium resolution mode lines. The following POKEs tell S.A.M. to leave the lights on:

POKE 8550,234:POKE 8551,234:POKE 8552,234

To experiment with S.A.M.'s speed, POKE values between 40 and 100 into location 8208. To experiment with S.A.M.'s pitch, POKE values between 30 and 90 into location 8209.

In Chatterbee I also played with what is known as S.A.M.'s waveform. I POKEd 14 into location 8554, 13 into location 8559, and 10 into location 8564. You will find a little trial and error with these locations can create some very interesting results. You can make S.A.M. sound like anything from a growling monster to E.T.

To those S.A.M. owners who would like to learn more about using S.A.M., I highly recommend Educational Software's **Tricky Tutorial #12**.

Player/Missile graphics don't seem to bother S.A.M. at all, so use them as much as possible for your graphics and animation.

Your playfield display must avoid any text mode lines or text windows. You should keep your display list as short as possible. To display text, draw letters on the screen as shown in the BASIC DRAWTEXT program.

The reason you cannot use text modes is that the Operating System has to do a great deal more work during the creation of the display if text is to be displayed. For every character space, the OS must fetch eight bytes of information, whether or not a character is visible. Similarly, if you use high-resolution or four-color graphics mode, the display takes many more machine cycles to create. Even though you aren't aware of the extra time involved, S.A.M. requires every cycle he can get, and is slowed down to a growl if he doesn't get his way.

DRAWTEXT will check to see if you booted with a S.A.M. diskette. If so, he will announce each upper-case letter that you type. If you don't have S.A.M. in RAM, the program will only display letters.

Let us know if you come up with any interesting applications for S.A.M. or improvements in display methods or voice quality.

continued on next page

REQUIRES S.A.M., DISK, 32K

```
99 REM ANTIC MAGAZINE
100 REM DRAWTEXT 8/3/83
105 REM BY JERRY WHITE
110 REM
115 GOTO 155:REM BYPASS SUBROUTINE
120 REM
125 REM CHARACTER FETCH SUBROUTINE
130 REM FOR GR.4 DISPLAY
135 JW=57344+CP*8-1:REM LOCATE CHARACT
ER DATA IN ROM
140 FOR ME=SM TO SM+70 STEP 10:JW=JW+1
:POKE ME,PEEK(JW):NEXT ME:RETURN
145 REM
150 REM INITIAL SCREEN DISPLAY
155 GRAPHICS 0:POKE 752,1:SAM=8192
160 POSITION 6,3:? "DRAWTEXT DEMO BY J
ERRY WHITE":POSITION 9,6
165 REM
170 REM FIND OUT IF SAM IS AVAILABLE
175 IF PEEK(SAM)=104 AND PEEK(SAM+1)=7
6 THEN ? "    S.A.M. IS IN RAM":SAMFLAG
=1:GOTO 185
180 ? "S.A.M. IS NOT IN RAM":SAMFLAG=0
185 IF  NOT SAMFLAG THEN 225
190 REM
195 REM POKE S.A.M.
200 POKE 8550,234:POKE 8551,234:POKE 8
552,234
205 POKE 8208,60:POKE 8209,60
210 POKE 8554,14:POKE 8559,13:POKE 856
4,10
215 REM
220 REM CONVERT DATA TO STRING
225 POSITION 2,9:? "CREATING D6$ FROM
DATA";
230 REM
235 REM DISPLAY A DOT FOR EACH BYTE
240 DIM D6$(184)
245 FOR ME=1 TO 184:READ IT:D6$(ME,ME)
=CHR$(IT):? ".";:NEXT ME
250 REM
255 REM MORE HOUSEKEEPING
260 GRAPHICS 6:DL=PEEK(560)+256*PEEK(5
61):REM FIND DISPLAY LIST
265 DIM SAM$(20),LINE$(20),AL$(130)
270 REM
275 REM DEFINE SAM'S ALPHABET
280 AL$="EYY4 BIYY4SIYY4DIYY4IYY4 EH4F
 DJIY4EY4CHAY4 "
285 AL$(LEN(AL$)+1)="JEY4 KEY4 EH4L EH
4M EH4N OW4  PIY4 KYUW4AA4R "
290 AL$(LEN(AL$)+1)="EH4S TTIY4YUW4 VI
Y4 WWWWWEH4KSWAY4 ZIY4 "
295 REM
300 REM SETUP MIXED DISPLAY LIST
305 POKE DL+3,75:FOR ME=DL+6 TO DL+13:
POKE ME,11:NEXT ME
310 FOR ME=DL+14 TO DL+49:POKE ME,9:NE
XT ME
315 FOR ME=DL+50 TO DL+64:POKE ME,11:N
EXT ME
320 POKE DL+65,65:POKE DL+66,PEEK(560)
:POKE DL+67,PEEK(561)
325 REM
330 REM USE IOCB #5 FOR THE KEYBOARD
335 CLOSE #5:OPEN #5,4,0,"K:"
340 REM
345 REM NOW WE'RE READY
350 REM TO DISPLAY OUR TOP LINE
355 LINE$="DRAWTEXT":PX=7:PY=1:GOSUB 6
40
360 REM
365 SM=PEEK(88)+256*PEEK(89):REM LOCAT
E SCREEN MEMORY
370 SM=SM+302:REM ADD OFFSET TO CENTER
 SCREEN
375 REM
380 REM DISPLAY "S.A.M." IN MODE GR.4
385 CP=ASC("S")-32:GOSUB 135
390 CP=ASC(".")-32:SM=SM+1:GOSUB 135
395 CP=ASC("A")-32:SM=SM+1:GOSUB 135
400 CP=ASC(".")-32:SM=SM+1:GOSUB 135
405 CP=ASC("M")-32:SM=SM+1:GOSUB 135
410 CP=ASC(".")-32:SM=SM+1:GOSUB 135
415 REM
420 REM DISPLAY INSTRUCTIONS
425 REM SLIDING UP FROM THE BOTTOM
430 PX=1:LINE$="TYPE A LETTER PLEASE"
435 FOR PY=36 TO 28 STEP -1:GOSUB 640:
NEXT PY
440 REM
445 REM ERASE WHAT WE LEFT BEHIND
450 FOR PY=41 TO 34 STEP -1:COLOR 0:PL
OT 0,PY:DRAWTO 159,PY:NEXT PY
455 REM
460 REM KEYBOARD INPUT ROUTINE
465 POKE 764,255:PX=10:PY=36
470 IF PEEK(764)=255 THEN 470
475 GET #5,KEY:IF KEY<65 OR KEY>90 THE
N KEY=63:REM LETTERS ONLY
480 LINE$=CHR$(KEY):GOSUB 640:REM DISP
LAY CHARACTER
485 IF  NOT SAMFLAG THEN 465:REM WAIT
FOR ANOTHER KEY
490 IF KEY=63 THEN SAM$="UH1PS":GOTO 5
15:REM DISPLAY ? AND SAY OOOPS
495 REM
500 REM LOOK IT UP IN SAMS DICTIONARY
505 STINDEX=KEY-65:SAM$=AL$(STINDEX*5+
1,STINDEX*5+5)
510 IF SAM$="WWWWW" THEN SAM$="DAH4BUL
YUW6":REM W
515 SAM$(LEN(SAM$)+1)=".":TALK=USR(SAM
):REM SAM SPEAKS
520 GOTO 465:REM PLAY IT AGAIN SAM
525 REM
530 REM DATA FOR MODE6 DISPLAY SUBROUT
INE
535 DATA 104,104,133,204,104,133,203,1
04,104,141
540 DATA 0,6,104,104,141,1,6,206,1,6
545 DATA 104,104,141,2,6,206,2,6,173,4
8
550 DATA 2,133,207,173,49,2,133,208,16
0,4
555 DATA 177,207,141,4,6,200,177,207,1
41,5
```

```
560 DATA 6,172,2,6,240,17,24,173,4,6
565 DATA 105,20,141,4,6,144,3,238,5,6
570 DATA 136,208,239,24,173,4,6,109,1,
6
575 DATA 141,4,6,144,3,238,5,6,169,0
580 DATA 141,3,6,172,3,6,204,0,6,176
585 DATA 82,169,0,133,206,177,203,56,2
33,32
590 DATA 133,205,24,6,205,38,206,6,205
,38
595 DATA 206,6,205,38,206,165,206,9,22
4,133
600 DATA 206,173,4,6,133,207,173,5,6,1
33
605 DATA 208,160,0,162,6,177,205,145,2
07,230
610 DATA 205,208,2,230,206,24,165,207,
105,20
615 DATA 133,207,144,2,230,208,202,16,
232,238
620 DATA 3,6,238,4,6,208,3,238,5,6
625 DATA 56,176,166,96
630 REM
635 REM DISPLAY MODE 6 TEXT SUBROUTINE
640 ASM=USR(ADR(D6$),ADR(LINE$),LEN(LI
NE$),PX,PY):RETURN
```

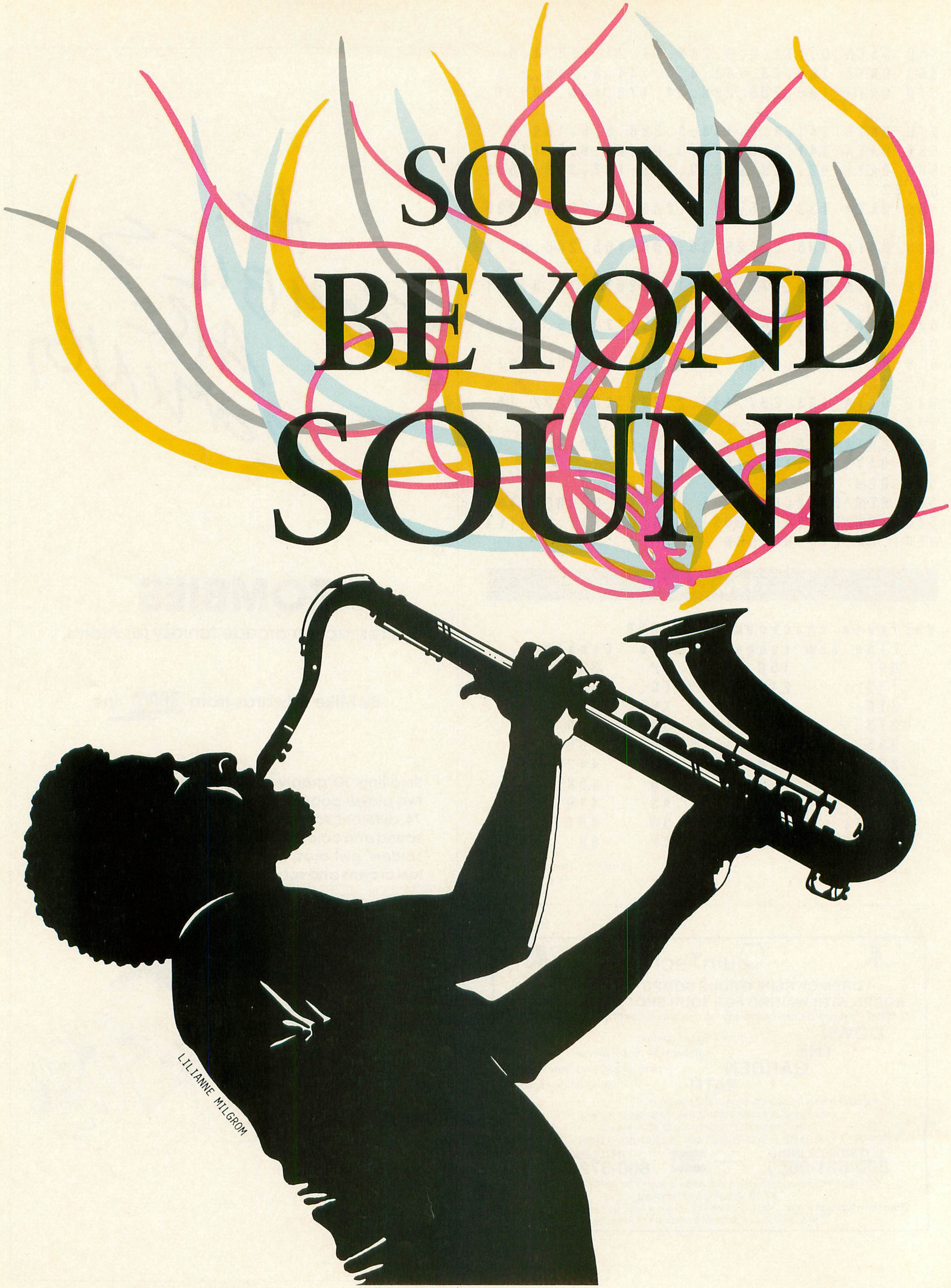
TYPO TABLE

Variable checksum = 430968

Line num range	Code	Length
99 – 150	JP	315
155 – 210	FG	472
215 – 270	XV	330
275 – 330	UR	509
335 – 390	YF	386
395 – 450	DG	443
455 – 510	EQ	458
515 – 570	AS	419
575 – 630	OW	401
635 – 640	VP	68

continued on page 104

SOUND BEYOND SOUND



Breaking the BASIC barrier

by CHRIS CHABRIS

ATARI sound capabilities are very strong, compared to most other small computers, and are completely at the disposal of the programmer. Unfortunately, that access is not well explained in the *Atari BASIC Reference Manual.* You should reread pages 57–58 of the manual to fully benefit from this article, but I intend to take you well beyond the basics, show you some techniques for better use of sound, and finally give you a "sound editor" program to test and select various sounds for use in your programs.

First, let's examine the SOUND command in BASIC, to see how it works, and how we can avoid its limitations.

Sound is generated on ATARI computers by the chip called POKEY (an acronym for POtentiometers and KEYs), a cousin of the GTIA and ANTIC chips. POKEY is capable of routing four individual sound frequencies through the television speaker at any one time. Each frequency is associated with a value ranging from zero to 255, and so can be specified in one byte of memory. These independent frequencies are known as "voices" or "sound channels" because they play one tone at a time.

The frequency generated by each voice is affected by a control value for that voice, also a one-byte number. Packed into the control value are the distortion and volume parameters of the BASIC SOUND command. Distortion, used primarily to cause sound effects, ranges from zero to 14 (even values only), with 10 considered as "pure." Volume ranges from zero to 15, with eight considered normal.

How do these numbers reach POKEY so that it can generate the proper sounds? The POKEY chip itself is controlled by several hardware registers, which are like memory addresses on the chip. Values can be POKEd into them just like normal memory addresses. However, the value obtained by PEEKing into these registers is usually not the same as the one previously POKEd in. Generally, each register has two functions — one when it is read and another when it is written to.

As you may have expected, four of these registers hold the frequency values for the four voices and four of them hold the control values. Incidentally, when PEEKed, these registers will give you the instantaneous values of the eight Paddle Controllers, just as does the PADDLE command in BASIC.

Now let's try generating some sounds by POKEing these registers directly. The command SOUND 0,19,10,8 will produce a high G note of pure distortion and moderate volume on channel number one. How could we duplicate this with POKE commands? Consulting Table 1, we find that the frequency is POKEd into 53760. So type:

```
POKE 53760,19
```

The control value poses a greater problem. In order to get the distortion and volume numbers into one byte, use the following formula:

CONTROL = 16*DISTORTION + VOLUME

Therefore, the control value is 16*10 + 8, or 168. The control register for voice zero is 53761, so the second POKE statement is:

```
POKE 53761,168
```

If you turned off the original sound with a SOUND 0,0,0,0 command, you should now hear the same tone again.

Try the same experiment with other values, comparing the results obtained with SOUND and POKE. They will be identical.

Now let's consider one of the deficiencies of the Atari BASIC SOUND command, the lack of a duration parameter (I understand that the SOUND command in **Atari Microsoft BASIC** has such a parameter). To get around this deficiency, routines that play music or sound effects are often timed by FOR/NEXT loops. For example:

```
100 SOUND 0,128,10,8
110 FOR L = 1 TO 100:NEXT L
120 SOUND 0,0,0,0
```

This would play a low B note for whatever length of time it took the loop to execute. If we could make a table relating the lengths of empty loops to their execution times, this would be a perfect method of timing sounds. Unfortunately, we can't.

The speed of a FOR/NEXT loop depends on its position in the program; it is slowest at the end of a program and fastest at the beginning. The difference is especially noticeable in long programs. Try it yourself.

Luckily, there is an accurate way of measuring the duration of sounds. Every sixtieth of a second, memory location 540 decrements by one until it reaches zero. Then it is restored to 255, and starts to count down again. Therefore, if we want to play a middle C note for one second, we could use the following code:

```
100 SOUND 0,121,10,8
110 POKE 540,60
120 IF PEEK(540)>0 THEN 120
130 SOUND 0,0,0,0
```

This works very well (you can verify it with a stopwatch), and allows songs to be played with perfectly timed notes and rests.

continued on next page

Christopher Chabris is a high school senior and Junior Programmer for an IBM installation company in New York. He is a candidate Chess Master and has represented the U.S. in international Chess competition.



Location 540 may skip a count under certain conditions, but this is unlikely to occur in a BASIC music-playing or sound effects routine.

There is another problem with using any of the techniques here to play music in a program. If you use a subroutine to play a song, all other action in the program must stop while your routine executes. This can be tens of seconds with a long piece, causing a long interruption.

As usual, there is a solution — the vertical blank interrupt (VBI). This occurs almost precisely every sixtieth of a second, when the electron beam drawing the screen display reaches the lower right corner and must return to the upper left. The screen actually goes blank at this time, although it happens too fast for us to see. Whatever program in whatever language is executing at the time stops, and a different one begins. When its execution is complete, the main program resumes exactly where it stopped without knowing what happened.

This "secondary program" consists of two stages: immediate and deferred. The ATARI has an immediate routine built into the Operating System (OS) which maintains the real-time clock and timers (such as location 540), reads the controller ports, and performs other miscellaneous tasks.

Fortunately, there is no real built-in deferred VBI routine, so we can insert our own. Since the VBI routine is transparent to the main program, it can change the sound registers on POKEY and maintain durations in sixtieths of a second without visibly interfering with the applications program (Wouldn't you like a little background music during a long word processing session?).

There is one problem: a VBI routine must be written in machine language. Since most of you probably don't program in machine language, I have provided such a routine that you can incorporate in your own programs. It consists of three parts: the actual deferred VBI routine, which is POKEd into Page Six of memory (a reserved area); a short program, contained in a string, that makes the OS aware of our routine; and a similar program to turn off the VBI routine.

Listing 1 is a BASIC loader program to set up the necessary machine language. It ends with a RETURN command, so you can use it as a subroutine in your own programs.

The music-playing VBI is very easy to use in BASIC. Before using it, execute a GOSUB20000 command to load all of the necessary machine language into memory. Now, you must POKE in several parameters. Table 2 is a list of the various memory locations that hold these parameters. First, there is the number of voices that your music requires: 1, 2, 3, or 4. This is POKEd into memory location 1712. Next, for each voice, you must set the address of the music to be used with the following code:

```
V1A = ADR(V1$)
V1AH = INT(V1A/256)
V1AL = V1A-256*V1AH
POKE XXXX,V1AL
POKE XXXX + 1,V1AH
```

V1$ holds the music table for voice number one and XXXX is the address on Page Six that holds the address of the string containing the music (see Table 2). These lines should be repeated for each voice (V2$, V3$, V4$).

A music string contains values for each note grouped in pairs of *Frequency* and *Duration* (in sixtieths of a second). The frequencies 255 and 254, however, have special meanings and therefore cannot be used to specify notes. A 255 tells the VBI routine to completely turn off the voice whose string contains that byte. A 254 tells the routine to repeat the music for that voice from the beginning. One of the limitations of the routine is that a music string can be a maximum of 255 bytes long. Since each note requires two bytes, a voice may play a maximum of 127 notes before they either repeat or end. Most songs that would be used in programs are shorter than this, so it should not be a big problem.

If you want to turn off a voice, POKE a one (1) into its status address, locations 1725 through 1728 for the four voices. POKE a zero into a status address to restart the voice where it left off.

To completely end all voices and turn off the VBI routine, execute the following code:

```
Q = USR(ADR(RESET$))
FOR L = 0 TO 3
SOUND L,0,0,0
NEXT L
```

Pressing [SYSTEM RESET] will also kill the VBI routine. Remember, this information is summarized in Table 2.

To help you start using this system in your own programs, I have included Listing 2, a demonstration program using one voice to play the theme from a familiar movie. When merged with Listing 1 (through the use of the ENTER command), it will produce a skeleton program that you can modify and incorporate directly into your own code. It is documented by REMark lines and includes all necessary POKE commands. Have fun!

There is one more POKEY register to discuss, and it single-handedly gives the ATARI greater sound capabilities than most, if not all other personal computers. Location 53768, known as AUDCTL (For AUDio ConTroL), provides you with eight additional options which affect all four sound channels. Table 3 is a summary of the functions available with the AUDCTL register. Each bit of AUDCTL enables an option when set to one and disables it when set to zero. To find the number to POKE into AUDCTL, add up the numbers to the left of each option that you want to enable. These options are explained in greater detail below.

Poly counters provide random pulses used to generate the distortion in the sound channels. By setting bit 7, you can make the patterns set by various distortion values more regular, because long polys do not generate obvious repetition.

Clocking a channel with 1.79 MegaHertz (millions of cycles per second) will simply result in a much higher pitch, because the normal clock base is set at 64 KHz, or 64,000 cycles per second. Bits 6 and 5, when set, change the clock base for voices one and three only.

POKEY normally has a frequency range of zero to 255, allowing for about four octaves. Setting bits 4 and 3 of AUDCTL joins two voices so that their combined frequency ranges from zero to 65535 (known as 16-bit resolution), resulting in a nine-octave range of pitches. The control registers of channels two and four determine the distortion and volume for the joined pairs "one and two" and "three and four." Of course, you cannot use the SOUND command with 16-bit music. The following routine will cycle through the 16-bit frequency range:

```
100 SOUND 0,0,0,0
110 POKE 53768,16
120 POKE 53761,0:POKE 53763,170
130 FOR LO=0 TO 255
140 POKE 53762,LO
150 FOR LI=0 TO 255
160 POKE 53760,LI
170 NEXT LI
180 NEXT LO
190 GOTO 100
```

At the end of the loop, when both LI and LO are 255, the output frequency is approximately one Hz, so you hear a low pop every second. Change the POKE value in line 110 to 80 and observe the difference. This switches the channel-one clock to 1.79 MHz and produces higher quality low notes. Remember that you should always execute a SOUND 0,0,0,0 command before the sound routine in your programs, in order to properly initialize POKEY.

Setting bits 2 and 1, enabling high-pass filters, allows only high frequencies to pass through a sound channel. The lowest frequency that can pass is defined as one more than the frequency of the clock channel. The following program uses a high-pass filter to produce an interesting sound, somewhat like a "red alert" on a spaceship:

```
100 SOUND 0,0,0,0
110 POKE 53768,4
120 POKE 53761,170
130 POKE 53764,150
140 FOR L=255 TO 0 STEP -1
150 POKE 53760,L
160 NEXT L
170 GOTO 140
```

Other special effects can be created by varying the clock frequency while the filtered voice is playing.

The last option available, enabled by setting bit 0, is switching the clock base for all four voices from 64 KHz to 15KHz. With this clock base, the normal tones will be much lower, just as they were higher with bits 6 and 5 set. Go back to the 16-bit resolution music program and change line 110 to the following:

```
110 POKE 53768,17
```

By adding one, you change the main clock base as described above. Now RUN the program. At the end of the loop, the frequency is approximately 250 milliHertz, or one pop every four seconds!

Clearly, there is tremendous potential for experimentation with all these registers and options. As a bonus program, I have included a short sound-editor as Listing 3 that will let you change the frequency, distortion, and volume values for all four voices. The setting of each AUDCTL bit is displayed and alterable.

Once you have typed in the program and corrected any typos, RUN it. The screen turns orange for a few seconds and then displays a Graphics Mode 0 screen divided into six colored windows (the order of colors may vary slightly the next time you RUN the program).

The top window displays the title block, general status line, and command-reminder line. A "VOICE" indicates which voice you are working on at present, and the two numbers to the right of it are the values of the joined voices. These values are only updated when the appropriate AUDCTL bits are set, so you won't see them change at first. The last line of this window reminds you that the [START], [SELECT], and [OPTION] keys, the stick and trigger are the only inputs used to control the program.

The next four windows display all information for each of the four voices: frequency, volume, and distortion on the first line, and a graphic representation of the frequency on the next three lines.

The last window shows the status of the AUDCTL register, including the value of each bit and the total decimal value (useful for writing POKE commands in your own programs). Using Table 3 in conjunction with this window permits you to selectively enable the various options.

At the beginning of the program, the arrow on the graph for the frequency of voice number one is white and the other arrows are black. This is a reminder that you are working with voice number one now. Plug a joystick into Port One and move it left or right to increase or decrease the frequency value, and push the trigger to increase the frequency value by 25. Select another voice by moving the stick up or down, lighting up a different arrow.

By pushing the [SELECT] and [OPTION] console buttons, you can increase the volume and distortion of the chosen voice. When they reach the maximum value, they "roll over" to zero.

The [START] button is used to change bits of the AUDCTL register. The voice's arrow disappears, and a box appears around bit 7 in the bottom window. Move the stick left or right to place the box over a different bit number. Press the trigger to change the value of that bit from zero to one or vice-versa. To go back and edit the voice again, press [START]. That's all there is to it. When you produce an interesting sound, write down the values and use them in your own program.

While the two utilities I have presented are quite useful, there is always plenty of room for improvement. If you come up with an interesting modification to any of the listings, send it to me c/o ANTIC so other readers can take advantage of it in their own programming.

Some suggestions: Modify the VBI routine to allow variable volume and distortion values for each note, handle songs longer than 127 notes, and use 16-bit resolution music. For

continued on next page



you BASIC programmers, how about putting an option into the sound editor to display the meanings of the AUDCTL option and adding a sound storage feature (to disk or tape).

TABLE ONE: Sound Registers on POKEY

ADDRESS			
Decimal	Hexadecimal	Label	Function
53760	$D200	AUDF1	Voice #1 frequency (pitch)
53761	$D201	AUDC1	Voice #1 control (distortion/volume)
53762	$D202	AUDF2	Voice #2 frequency
53763	$D203	AUDC2	Voice #2 control
53764	$D204	AUDF3	Voice #3 frequency
53765	$D205	AUDC3	Voice #3 control
53766	$D206	AUDF4	Voice #4 frequency
53767	$D207	AUDC4	Voice #4 control

TABLE TWO: VBI Music Routine — Important Memory Locations

ADDRESS			
Decimal	Hexadecimal	Label	Function
1712	$06B0	NUMV	Number of voices to play
1713–1714	$06B1–06B2	V0ADR	Address of Voice #1 music in lobyte/hibyte form
1715–1716	$06B3–06B4	V1ADR	Address of voice #2
1717–1718	$06B5–06B6	V2ADR	Address of voice #3
1719–1720	$06B7–06B8	V3ADR	Address of voice #4
1721–1724	$06B9–06BC	DUR1–4	Duration of voices #1–4 in 60ths of a second
1725–1728	$06BD–06C0	STATUS1–4	Status of voices #1–4: 0 = play voice 1 = voice inactive
1729–1732	$06C1–06C4	COUNT1–4	Position in music string currently being accessed
1733–1736	$06C5–06C8	PAUSE1–4	Pause flag: 3 = pause in progress 0 = playing note
1737	$6C9	AUD	Value to be stored in the AUDCTL register (see text)

TABLE THREE: AUDCTL Register — Bit Options

Decimal Value	Bit Number	Function Enabled (if Bit Set to 1)
128	7	Turn 17-bit poly-counter into 9-bit poly-counter
064	6	Clock channel 1 with 1.79 MHz
032	5	Clock channel 3 with 1.79 MHz
016	4	Join channels 1 + 2 for 16-bit resolution
008	3	Join channels 3 + 4 for 16-bit resolution
004	2	Insert high-pass filter into channel 1 (clocked by channel 3)
002	1	Insert high-pass filter into channel 2 (clocked by channel 4)
001	0	Change main clock base to 15 KHz (normally 64 KHz)

TOTAL = Value to POKE into 53768 (or 1737 if you're using the VBI music routines)

Requires 16K RAM

Listing 1

```
20000 RESTORE 20010:FOR L=1536 TO 1737
:READ B:POKE L,B:NEXT L
20010 DATA 162,0,160,0,32,155
20020 DATA 6,189,177,6,133,203
20030 DATA 189,178,6,133,204,32
20040 DATA 161,6,189,189,6,208
20050 DATA 118,222,185,6,208,113
20060 DATA 188,193,6,177,203,201
20070 DATA 255,208,22,169,1,157
20080 DATA 189,6,169,0,32,155
20090 DATA 6,157,0,210,157,1
20100 DATA 210,32,161,6,76,143
20110 DATA 6,201,254,208,18,169
20120 DATA 0,157,193,6,169,1
20130 DATA 157,185,6,169,0,157
20140 DATA 197,6,76,143,6,72
20150 DATA 189,197,6,208,23,169
20160 DATA 3,157,185,6,157,197
20170 DATA 6,169,0,32,155,6
20180 DATA 157,0,210,32,161,6
20190 DATA 104,76,143,6,169,0
20200 DATA 157,197,6,104,32,155
20210 DATA 6,157,0,210,169,166
20220 DATA 157,1,210,32,161,6
20230 DATA 200,177,203,157,185,6
20240 DATA 200,152,157,193,6,232
20250 DATA 236,176,6,208,3,76
20260 DATA 167,6,76,4,6,72
20270 DATA 138,10,170,104,96,72
20280 DATA 138,74,170,104,96,173
20290 DATA 201,6,141,8,210,76
20300 DATA 98,228,0,0,0,0
20310 DATA 0,0,0,0,0,1
20320 DATA 1,1,1,0,0,0
20330 DATA 0,0,0,0,0,0
20340 DATA 0,0,0,0
20350 RESTORE 20360:DIM SET$(11):FOR L
=1 TO 11:READ B:SET$(L)=CHR$(B):NEXT L
20360 DATA 104,160,0,162,6,169
20370 DATA 7,32,92,228,96
20380 RESTORE 20390:DIM RESET$(11):FOR
 L=1 TO 11:READ B:RESET$(L)=CHR$(B):NE
XT L
20390 DATA 104,160,98,162,228,169
20400 DATA 7,32,92,228,96
20410 RETURN
```

TYPO TABLE

Variable checksum = 98156

Line num range	Code	Length
20000 - 20110	FB	325
20120 - 20230	RJ	294
20240 - 20350	ON	299
20360 - 20410	FW	165

Listing 2

```
1000 REM - LOAD V1$ WITH MUSIC FROM DA
TA STATEMENTS
1010 DIM V1$(41):RESTORE 1090:FOR L=1
TO 40:READ B:V1$(L)=CHR$(B):NEXT L:V1$
(41)=CHR$(254)
1020 REM - SET UP THE THREE ROUTINES,
POKE IN NUMBER OF VOICES AND ADDRESSES
1030 GOSUB 20000:POKE 1712,1:V1A=ADR(V
1$):V1AH=INT(V1A/256):V1AL=V1A-256*V1A
H:POKE 1713,V1AL:POKE 1714,V1AH
1040 REM - POKE AUDCTL VALUE AND START
 ROUTINE
1050 POKE 1737,0:Q=USR(ADR(SET$))
1060 REM - YOUR PROGRAM COMES NEXT
1070 GOTO 1070
1080 REM - MUSIC DATA FOR VOICE #1 FOL
LOWS
1090 DATA 207,10,207,10,207,10,162,60,
108,60,121,10,128,10,144,10,81,60,108,
30,121,10,128,10,144,10,81,60,108,30
1100 DATA 121,10,128,10,121,10,144,30,
0,30
```

TYPO TABLE

Variable checksum = 146487

Line num range	Code	Length
1000 - 1090	ZO	575
1100 - 1100	TD	38

Listing 3

```
1000 REM ***  SOUND EDITOR. rev. 1.0
1010 REM ***  By Chris Chabris 1983
1020 REM ***  For ANTIC Magazine
1030 REM ***  Allows modification of 4
1040 REM ***  voices and AUDCTL value.
1050 FOR L=53760 TO 53768:POKE L,0:NEX
T L:SOUND 0,0,0,0:VOICE=1
1060 GRAPHICS 0:POKE 710,54:POKE 709,0
:POKE 752,1:POKE 82,1:POKE 83,38:? CHR
$(125):POKE 54286,64:GOSUB 1630
1070 REM - MAIN PROGRAM LOOP
1080 POKE 53279,0
1090 IF STRIG(0)=0 THEN 1340
1100 IF PEEK(53279)=6 THEN 1390
1110 IF PEEK(53279)=5 THEN 1560
1120 IF PEEK(53279)=3 THEN 1590
1130 IF STICK(0)=15 THEN 1090
1140 IF STICK(0)<>14 THEN 1170
1150 POKE 703+VOICE,0:VOICE=VOICE-1:IF
 VOICE=0 THEN VOICE=4
1160 POSITION 8,2:? VOICE;:POKE 703+VO
ICE,12:FOR L=1 TO 100:NEXT L:GOTO 1080
1170 IF STICK(0)<>13 THEN 1200
1180 POKE 703+VOICE,0:VOICE=VOICE+1:IF
 VOICE=5 THEN VOICE=1
1190 POSITION 8,2:? VOICE;:POKE 703+VO
ICE,12:FOR L=1 TO 100:NEXT L:GOTO 1080
1200 IF STICK(0)<>7 THEN 1270
1210 V=VOICE:IF FREQ(V-1)=255 THEN 109
0
1220 FREQ(V-1)=FREQ(V-1)+1:POSITION 19
,V*4:? FREQ(V-1);" ";
1230 POKE 53247+V,58+INT(FREQ(V-1)/2)
1240 POKE 53758+V*2,FREQ(V-1):IF AUDCT
L(4)=1 AND V<3 THEN POSITION 22,2:? "
     ←←←←←";FREQ(0)+256*FREQ(1);
1250 IF AUDCTL(3)=0 OR V<3 THEN 1200
1260 POSITION 33,2:? "     ←←←←←";FREQ
(2)+256*FREQ(3);:GOTO 1200
1270 IF STICK(0)<>11 THEN 1090
1280 V=VOICE:IF FREQ(V-1)=0 THEN 1090
1290 FREQ(V-1)=FREQ(V-1)-1:POSITION 19
,V*4:? FREQ(V-1);" ";
1300 POKE 53247+V,58+INT(FREQ(V-1)/2)
1310 POKE 53758+V*2,FREQ(V-1):IF AUDCT
L(4)=1 AND V<3 THEN POSITION 22,2:? "
     ←←←←←";FREQ(0)+256*FREQ(1);
1320 IF AUDCTL(3)=0 OR V<3 THEN 1270
1330 POSITION 33,2:? "     ←←←←←";FREQ
(2)+256*FREQ(3);:GOTO 1270
1340 V=VOICE:FREQ(V-1)=FREQ(V-1)+25:IF
 FREQ(V-1)>255 THEN FREQ(V-1)=0
1350 POKE 53247+V,58+INT(FREQ(V-1)/2):
POKE 53758+2*V,FREQ(V-1):POSITION 19,4
*V:? "   ←←←";FREQ(V-1);
1360 IF AUDCTL(4)=1 AND V<3 THEN POSIT
ION 22,2:? "     ←←←←←";FREQ(0)+256*FR
EQ(1);
1370 IF AUDCTL(3)<>1 OR V<3 THEN 1100
1380 POSITION 33,2:? "     ←←←←←";FREQ
(2)+256*FREQ(3);:GOTO 1100
1390 Q=USR(ADR(SPRAY$),PMMEM+1024+(VOI
CE-1)*256,256):POSITION 1,3:? "  Togg
le AUDCTL bits with TRIGGER."
1400 POKE 53247+VOICE,0:RESTORE 1410:F
OR L=0 TO 11:READ B:POKE PMMEM+1024+(V
OICE-1)*256+198+L,B:NEXT L
1410 DATA 126,126,66,66,66,66,66,66,66
,66,126,126
1420 POKE 53247+VOICE,74:A=7:FOR L=1 T
O 50:NEXT L
1430 IF STRIG(0)=0 THEN 1480
1440 IF STICK(0)=11 THEN A=A+1:A=A-(8*
(A=8)):POKE 53247+VOICE,74+16*(7-A):FO
R L=1 TO 50:NEXT L:GOTO 1430
1450 IF STICK(0)=7 THEN A=A-1:A=A+(8*(
A=-1)):POKE 53247+VOICE,74+16*(7-A):FO
R L=1 TO 50:NEXT L:GOTO 1430
1460 IF PEEK(53279)=6 THEN 1520
1470 GOTO 1430
1480 POKE 53279,0:AUDCTL(A)=ABS(AUDCTL
(A)-1):SUM=0:FOR L=0 TO 7:IF AUDCTL(L)
=1 THEN SUM=SUM+INT(2^L+0.5)
1490 NEXT L:POKE 53768,SUM
```

continued on next page



```
1500 POSITION 7+4*(7-A),23:? AUDCTL(A)::POSITION 34,20:? "┌┬┬┐";SUM;
1510 POKE 53279,0:GOTO 1440
1520 Q=USR(ADR(SPRAY$),PMMEM+1024+256*(VOICE-1)):POKE 53247+VOICE,0
1530 RESTORE 1680:FOR L=0 TO 7:READ B:POKE PMMEM+1024+256*(VOICE-1)+(VOICE-1)*32+72+L,B:NEXT L
1540 POKE 53247+VOICE,58+INT(FREQ(VOICE-1)/2)
1550 POSITION 1,3:? " START-SELECT-OPTION  STICK-TRIGGER ":GOTO 1080
1560 VOL(VOICE-1)=VOL(VOICE-1)+1:IF VOL(VOICE-1)=16 THEN VOL(VOICE-1)=0
1570 POSITION 27,VOICE*4:? VOL(VOICE-1);"  ";:POKE 53759+VOICE*2,DIST(VOICE-1)*16+VOL(VOICE-1):GOTO 1090
1580 FOR L=1 TO 50:NEXT L:GOTO 1090
1590 DIST(VOICE-1)=DIST(VOICE-1)+2:IF DIST(VOICE-1)=16 THEN DIST(VOICE-1)=0
1600 POSITION 35,VOICE*4:? DIST(VOICE-1);"  ";:POKE 53759+VOICE*2,DIST(VOICE-1)*16+VOL(VOICE-1)
1610 FOR L=1 TO 50:NEXT L:GOTO 1090
1620 REM - INITIALIZATION ROUTINE
1630 PMP=PEEK(106)-16:PMMEM=PMP*256
1640 DIM SPRAY$(42):RESTORE 1650:FOR L=1 TO 42:READ B:SPRAY$(L)=CHR$(B):NEXT L:Q=USR(ADR(SPRAY$),PMMEM,2048)
1650 DATA 104,104,133,204,104,133,203,104,133,206,104,133,205,166,206,160,0,169,0,145,203,136
1660 DATA 208,251,230,204,202,48,6,208,244,164,205,208,240,198,204,160,0,145,203,96
1670 FOR L1=0 TO 3:RESTORE 1680:FOR L2=0 TO 7:READ B:POKE PMMEM+1024+L1*256+L1*32+72+L2,B:NEXT L2:NEXT L1
1680 DATA 8,8,8,8,8,62,28,8
1690 RESTORE 1700:FOR L=0 TO 28:READ B:POKE 1536+L,B:NEXT L:POKE 207,0:POKE 512,0:POKE 513,6
1700 DATA 8,72,138,72,141,10,212,166,207,189,32,6,141,24,208,232,224,5,208,2,162,0,134,207,104,170,104,40,64
1710 POKE 1568,86:POKE 1569,118:POKE 1570,166:POKE 1571,198:POKE 1572,246
1720 DL=PEEK(560)+256*PEEK(561):FOR L=8 TO 24 STEP 4:POKE DL+L,130:NEXT L
1730 FOR L=704 TO 707:POKE L,0:NEXT L:POKE 54279,PMP:POKE 53277,3:POKE 623,1:POKE 559,62:POKE 54286,192
1740 POSITION 1,0:? " ***********SOUND EDITOR**********":? " *****By Chris Chabris 1983*****"
1750 ? :? " START-SELECT-OPTION STICK-TRIGGER"
1760 FOR L=4 TO 16 STEP 4:POSITION 1,L:? " VOICE #";L/4;":      FREQ=0    VOL=6  DIST=10":POSITION 1,L+2
1770 ? " ├┴┴┴┴┴┴┴┴┼┴┴┴┴┴┴┴┼┴┴┴┴┴┴┴┼┴┴┴┴┴┴┴┼┴┴┴┴┤":? " 000      064      128      192      255":NEXT L
1780 POSITION 1,20:? "AUDCTL SETTING:  (TOTAL VALUE=0  )":? "BIT | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |"
1790 ? " ├───┼───┼───┼───┼───┼───┼───┼───┤":? "IS  | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |";
1800 FOR L=53248 TO 53251:POKE L,58:NEXT L
1810 POSITION 2,2:? "VOICE=1         V1+2=0      V3+4=0   "
1820 DIM FREQ(3),VOL(3),DIST(3),AUDCTL(7):FOR L=0 TO 3:FREQ(L)=0:VOL(L)=6:DIST(L)=10:POKE 53761+2*L,166:NEXT L
1830 FOR L=0 TO 7:AUDCTL(L)=0:NEXT L:POKE 704,12:RETURN
```

TYPO TABLE

Variable checksum = 399456

Line num range	Code	Length
1000 - 1100	PF	500
1110 - 1210	ST	514
1220 - 1290	KH	527
1300 - 1350	TZ	513
1360 - 1420	QQ	538
1430 - 1500	UW	576
1510 - 1570	SW	513
1580 - 1650	RT	503
1660 - 1710	PU	517
1720 - 1770	LE	563
1780 - 1830	AD	503

WHAT IS A TYPO TABLE

Newcomers to ANTIC may wonder about the "Typo Table" that appears at the end of most of our basic listings. TYPO is a program that helps you find typing errors made when entering programs that appear in ANTIC. TYPO will produce a table of values which can be used to pinpoint where an error was made. The TYPO program and instructions originally appeared in Volume 1, Number 3 of ANTIC, and was reprinted in Volume 2, Number 1. The latter issue is still available as a back issue, and the TYPO program itself is included in ANTIC UTILITIES DISK #2.

NOTE: When comparing your TYPO TABLE with the one we publish, first look at the length column. For a given line number range, if your length is only off by one or two, it may be due to spacing. Missing or extra spaces generally occur between quotes or in a REM statement. Spaces must be accurately placed for TYPO to work, so first experiment with the spacing.

If you are serious about personal finance...

- **Budget Forecast** – 26 expense categories
- **Check Entry** – easy data entry – scan & modify 26 major & 36 sub-categories – information block
- **Check Search** – single or multiple parameters – (up to seven) to search entries
- **Tabulations** – detailed expense vs. budget comparisons by month, year-to-date, category
- **Bar Graphs** – screen displays in graph form expenses vs. budget – by month or category – printing with graphic capable printers
- **Check Reconciliation** – fast clearing of resident checks & deposits, complete summary report
- **Checkwriter** – prints your custom checks
- **Printouts** – most popular printers
- **Multi-Colored Graphics • Audio Enhancements**
- **7 Utility Programs • User-Friendly Operation**
- **Easy To Use Instruction Manual • Audit Report**
- **Handsome Tinted Plastic Storage Case**



COMPUTE!
The Leading Magazine Of Home, Educational, And Recreational Computing

In a feature editorial.

"If you want to use a finance system, but don't want to spend several days trying to learn how to use one, then A Financial Wizard by Computari may be just what you need."

"The illustrated manual that comes with this program is clear, direct, and very thorough."

"It appears that this finance system was designed to achieve the best and most comfortable working relationship between the user and the program."

"The check entry routine is the most attractive feature of this finance system. Data prompts are very clear and the category item names are displayed at all times during data entry for your convenience."

"The file search capabilities of this program are superior. You are offered seven ways to look up the checks."

"The system is disk intensive. All data is saved automatically and immediately following all routines that either enter data or modify it."

"Scanning your entries is made possible by pressing START. You can see records very quickly this way."

"This is an excellent finance system – entertaining, accurate, and fun to use."

ANALOG COMPUTING
THE MAGAZINE FOR ATARI COMPUTER OWNERS

Analog Magazine in a comprehensive study of personal finance systems for Atari* computers.

"A Financial Wizard from Computari is by far the best of these programs and will be the standard of comparison for the others."

"The check entry mode is easy to use..."

"The way a Financial Wizard handles your tabulations is excellent. You can chart your actual expenses vs. your budget by month, by category or year to date."

"...where it really outshines the rest is in the check reconciliation."

"In effect it gives you your bank statement on the screen, a complete list by month of all your checks and deposits."

"A Financial Wizard has one disk that does everything..."

"Graphics, while really not a factor in the quality of programs of this type, do make your budgeting chores a little more pleasant. Again A Financial Wizard comes out on top."

"Everything about this program is excellent..."

Antic
The ATARI Resource

In a Report from Antic.

"Like most Atarians, I am captivated by the graphic, color and sound capabilities of my machine. Nothing quite discourages me more than to boot up an applications program (personal, business, etc.) and to be presented with the standard graphic 'o' white characters on a blue screen.

Of course the usefulness and effectiveness of a program is of primary importance. However, enhancing the dullest of applications programs with some of Atari's charms, is a great asset. A Financial Wizard, a personal finance program by Computari's Bill McLachlan, is an excellent example of an applications program that integrates many of the Atari's features into a well conceived and executed program."

"The use of color and sound in the data input prompts and error checking routines are so well done that it's quite simple to boot up the disk, follow along with the very clear documentation, and be 'up and running' in short order."

"I give A Financial Wizard high marks in ease of use, documentation and performance. If a disk-based home finance package is in your future, The Wizard should get serious consideration."

Computari's
A Financial Wizard 1.5
The logical choice.

The system is designed for Atari computers having a minimum of 32K and operating from a disk drive. The cost is only $59.95 plus $3 for handling/postage.

If your dealer does not have **A Financial Wizard** ... Telephone orders are accepted on Mastercharge or Visa credit cards. Mail order must be accompanied by check or money-order or credit card #.

Dealer inquiries invited.

*trademark of Atari Inc.

OK residents ad 4% Tax.

Exclusively thru **ON LINE** COMPUTER CENTERS of OKC™ (405)751-7925

10944 North May, Oklahoma City, OK 73120

CHECK ENCLOSED VISA MASTERCHARGE

NAME (Print) ____________

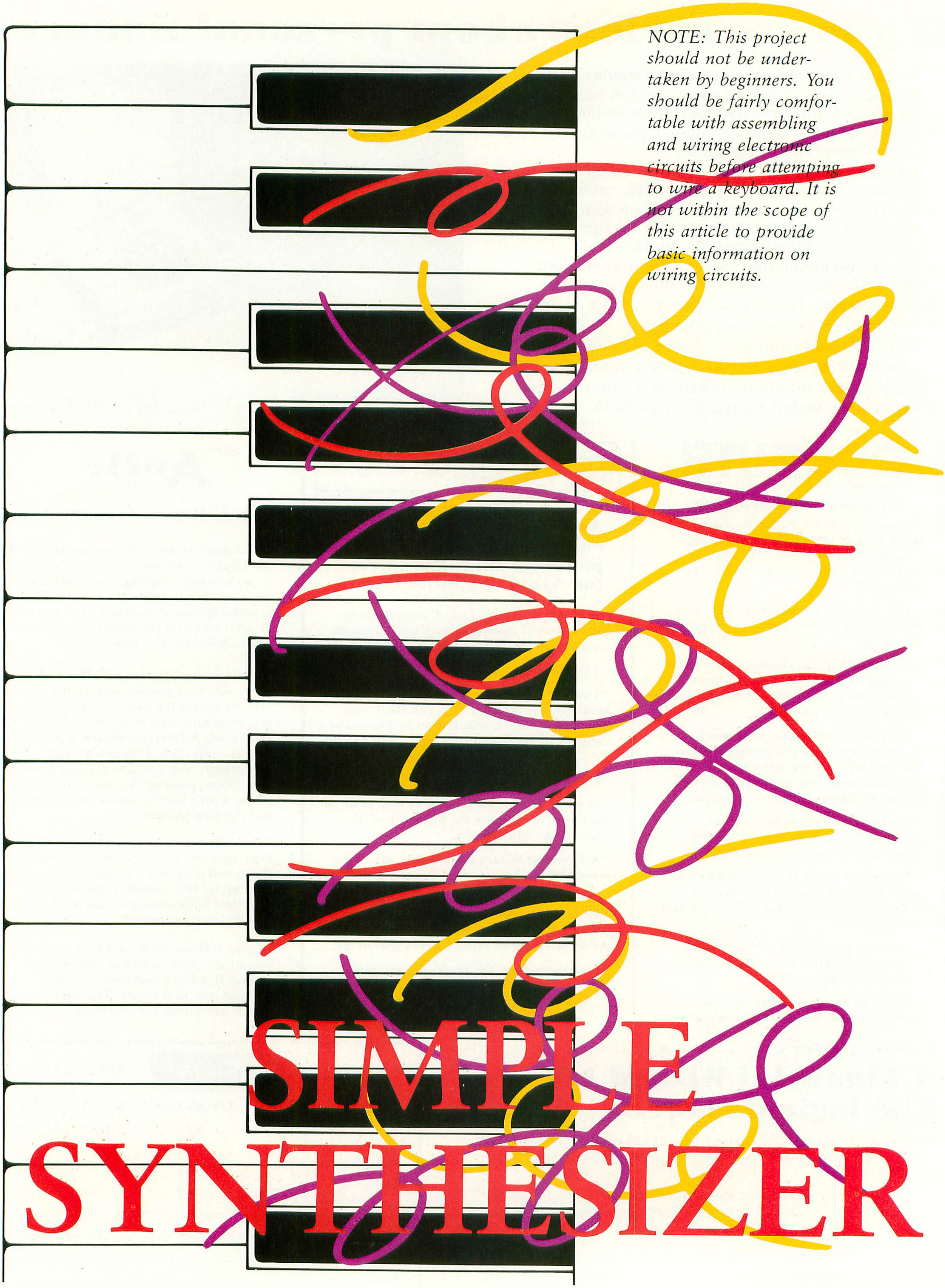
Address ____________

City ____________

State ____________ Zip ____________

Card # ____________ Exp. ____________

Signature ____________



NOTE: This project should not be undertaken by beginners. You should be fairly comfortable with assembling and wiring electronic circuits before attemping to wire a keyboard. It is not within the scope of this article to provide basic information on wiring circuits.

SIMPLE SYNTHESIZER

Make a musical peripheral for your ATARI

by VERN MASTEL

This article shows you how to build and connect a true piano-type keyboard that you can use with your ATARI computer as a simple music synthesizer. Included in the article is the software that allows you to play music.

The method is very simple from a hardware standpoint, requiring only some signal diodes and microswitches. The software will run on any ATARI computer from 16K on up with no modifications. Best of all, the program uses only BASIC — no machine language subroutines are used.

To begin, a discussion of the ATARI parallel data bus and joystick mechanics is necessary. "Beg pardon," you say, "the ATARI doesn't have a parallel data bus." Well, strictly speaking, it doesn't; but what it does have comes awfully close in this application. The ATARI joystick is a wonderfully simple device, consisting of only five switches and a housing. Four switches sense the major positions, and the fifth one senses the trigger (see Figures 1 and 2). Moving the stick in any given direction never closes more than two of the four switches at one time. Take a look at Program 1. Most will recognize it as a simple program to read the joystick position and print out the number corresponding to it.

Program 1

```
10 A=STICK(0):REM CAN BE ANY OF THE FOUR
   STICKS
20 PRINT A
30 GOTO 10
```

Note how the numbers run 5, 6, 7, 9, 10, 11, 13, 14, 15. What happened to 0, 1, 2, 3, 4, 8, 12? Now take the top off the joystick, RUN Program 1 and press two or more switches at once. Presto, the missing numbers appear! For a diagram of the switch patterns and the corresponding number returned by the STICK command, see Figure 3. What all of this boils down to is that each controller port on the ATARI can be treated as a four-bit parallel input port. Four bits are half of a byte and can be used to count in base 16. By selectively grounding combinations of the four input pins, the numbers from zero to 15 will be generated. This is the key to our Simple Synthesizer.

First, a keyboard is required. It can be anything from a dime store toy piano to a grand piano as long as it has the right complement of keys. I got mine from a junked Wurlitzer organ at a local music store for only $20. One octave (C through C) is all that is needed, so you should not have any problem finding something to suit. One octave is only 13 notes and there are 16 combinations available on one input port. If the note values are stored in a matrix in the same sequence they follow on the keyboard, then pressing a key will play the associated value stored in the matrix. For example,

Program 2

```
10 DIM M(3):M(1)=243 :M(2)=217: M(3)=193
20 FOR X=1 TO 3:SOUND 0,M(X),10,10
30 FOR D=1 TO 100:NEXT D:REM DELAY
40 NEXT X:SOUND 0,0,0,0
```

This program will play three notes, C, D and E, in succession. The SOUND command does not care where the arithmetic value which specifies the pitch comes from, so what happens if a joystick is used to generate the values? Try Program 3 and find out.

Program 3

```
 10 DIM M(13)
 20 FOR X=1 TO 13
 30 READ A
 40 M(X)=A
 50 NEXT X:REM GET THE NEXT VALUE
 60 A=STICK(0):IF A=0 THEN 60
 70 SOUND 0,M(A)-4,10,10
 80 GOTO 60
 90 DATA 243,230,217,204,193,182
100 DATA 173,162,153,144,136
110 DATA 128,121
```

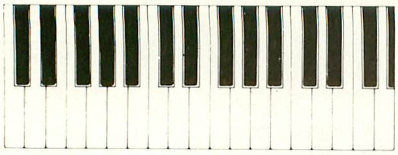
What this program does is to put 13 note values (one octave) into matrix M and then use the joystick to change the pitch. Are you beginning to get the idea of how the Simple Synthesizer will work?

One problem remains to be tackled. To generate each note with a keypress on a keyboard at least two switches would be needed if you counted from three to 15. If you count from one to 13 then at least three would be needed. The problem comes when you try to mount three microswitches under one key — there simply isn't enough room. The solution lies in the use of a diode matrix as shown in Figure 4. Using this, only one switch is needed to handle each number from one to 13. The diodes pass DC current in only one direction and thus isolate each port pin from the others.

One additional ATARI hardware feature used with the Simple Synthesizer is the game paddles. Each port handles two paddles. For this application, two ports are used. The reason for this is to allow individual control of the volume of each voice of the Synthesizer. Normally, the resistance value

continued on next page

Vern Mastel is the manager of a Team Electronics store in Bismarck, ND, where he sells computers, including the ATARI, and related equipment. His favorite pastime is writing programs.



of the potentiometers used in the paddles is one megohm (1,000,000 ohms). This value gives a count range of zero to 228. To use the paddles to control the volume, a range of only zero to 10 or 12 is needed. If you are using more than three voices, the highest recommended value for volume is eight. If the sum of all volumes exceeds 32, sound is distorted. You could use a one-meg pot and divide the count to limit it to 12, but that wastes time in the program and upsets the smooth operation of the notes. The solution is to use a 10K pot (10,000 ohms). This gives a working range of zero to about seven, which is just right.

Now that the hardware has been covered, it is time for the software. Program 4 is the listing of the program which allows you to use the keyboard. Sound generation is handled by three separate routines — one each for multiple-voice mode, chord mode and piano mode. The modes are what the names imply. In the multiple-voice mode each voice is active, its level or volume determined by the setting of the associated paddle pot. In the chord mode, pressing a key generates the major chord of that key. For example, pressing C also generates the notes E and G.

It is interesting to note that Atari says this cannot be done well from BASIC because BASIC is too slow. As you will see when you RUN the program it is not only possible, it works very well.

The piano mode is the most interesting of the group because it involves dynamics which really do strain BASIC to the limit. When in this mode, a key which is pressed and held will decay to zero volume and not play again till the key is released and pressed again. If the key is released before the decay is finished, the note will be cut off (this is similar to what you would encounter with the rest pedal on a piano). If one note is pressed and then another, before the first has decayed, the second note will then sound and be allowed to decay. The rate of decay is determined by the size of the D loop in line 60 of the program. A larger value will take longer to decay; a smaller value will yield a shorter decay.

In all modes, the frequencies of all of the notes are stored in matrixes (L)ow, (M)edium and (H)igh. These matrixes are automatically loaded with the correct values at the time of mode selection. You will notice that the screen is blank when a play mode is selected. This was done after I noticed that some notes would be missed if I played fast enough with the screen on. Turning off the screen allows the Operating System to read the ports more often and thus keeps the notes from getting lost.

Rather than going into a long line-by-line description of the program, I chose to comment it heavily. These REMarks are strictly for illustration and should be deleted from the program after you have checked it with TYPO. If REM statements are not removed, the piano voice may be adversely affected. This program is by no means the final word in synthesizers, but it is a springboard from which you can proceed.

Use of the program is very simple. When RUN, a menu of six choices is displayed:

1) Multiple voices
2) 1st Octave chords
3) 2nd Octave chords
4) Piano Octave 1
5) Piano Octave 2
6) Piano Octave 3

Pressing the number of the desired mode activates the music keyboard. The screen will go blank at the same time. Pressing any key on the computer keyboard will restore the menu. In the first three modes you can control the volume of the individual voices with the pots connected to the paddle inputs. In the piano mode, the volume is fixed.

Lastly, to all of the musicians out there, please don't attack me over the accuracy of the pitch of all of the notes. The numbers in the program are from the official Atari pitch chart. I know they aren't right on the button but remember this is done for fun, not for the New York Philharmonic.

Figure 1. Synthesizer viewed from top rear. Note plugs for joystick ports.

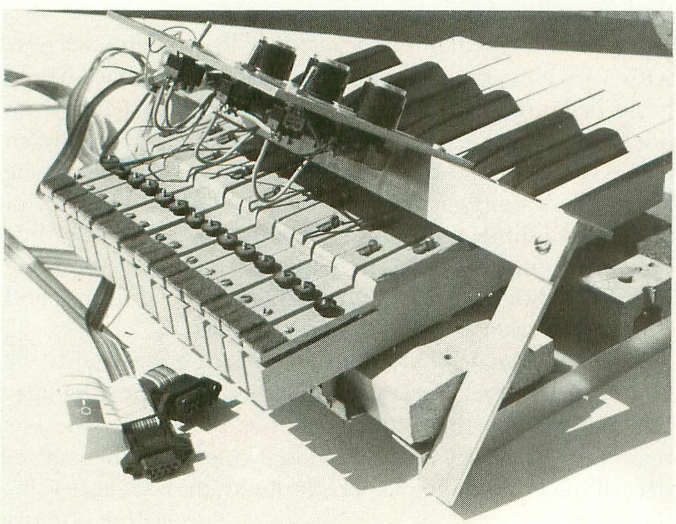
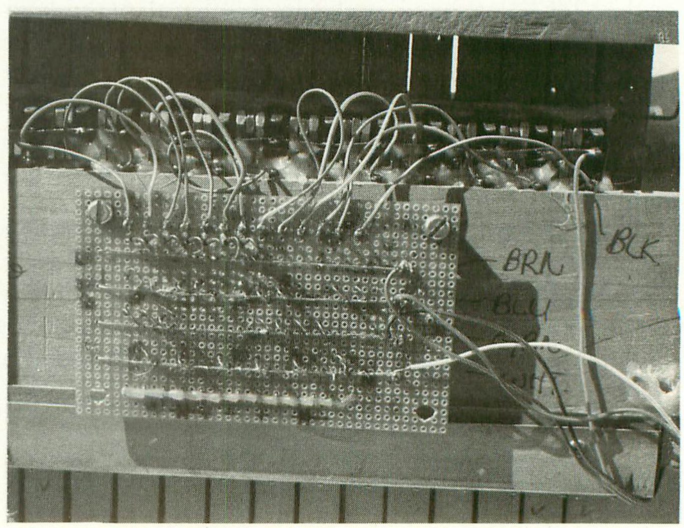


Figure 2. Underside of synthesizer shows wiring from switches to diode matrix.



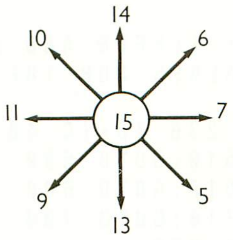


Figure 1

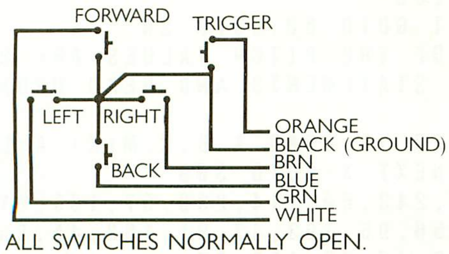


Figure 2

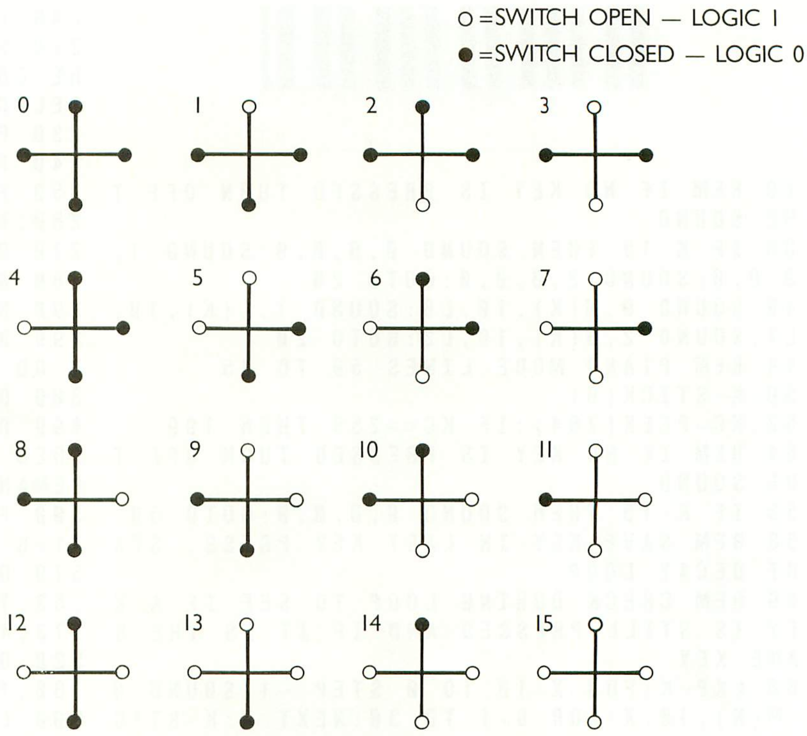


Figure 3

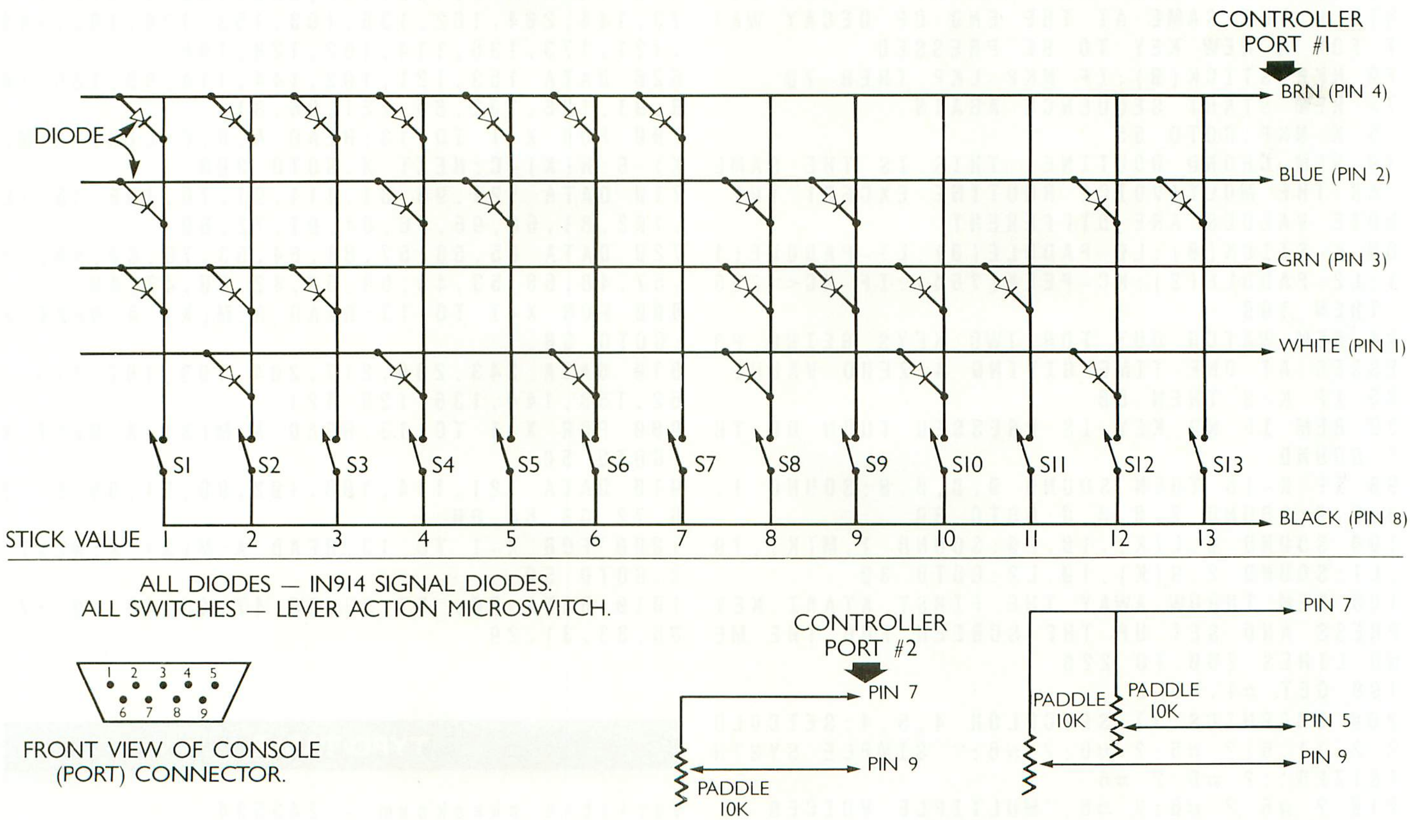
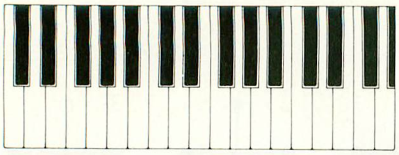


Figure 4

Requires 16K RAM and BASIC

```
1 REM PROGRAM 4
2 REM THE SIMPLE SYNTHESIZER BY VERN L
 . MASTEL
4 REM SET UP MATRIXES, OPEN KEYBOARD F
OR INPUT
5 DIM H(13),M(13),L(13):OPEN #1,4,Ø,"K
":TRAP 3ØØ:GOTO 2ØØ
19 REM MULTIVOICE ROUTINE LINES 2Ø-4Ø
2Ø K=STICK(Ø):LØ=PADDLE(Ø):L1=PADDLE(1
):L2=PADDLE(2):KC=PEEK(764):IF KC<>255
 THEN 199
```

continued on next page



```
29 REM IF NO KEY IS PRESSED TURN OFF THE SOUND
30 IF K=15 THEN SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0,0,0:GOTO 20
40 SOUND 0,M(K),10,L0:SOUND 1,L(K),10,L1:SOUND 2,H(K),10,L2:GOTO 20
49 REM PIANO MODE LINES 50 TO 75
50 K=STICK(0)
52 KC=PEEK(764):IF KC<>255 THEN 199
54 REM IF NO KEY IS PRESSED TURN OFF THE SOUND
55 IF K=15 THEN SOUND 0,0,0,0:GOTO 50
58 REM SAVE KEY IN LAST KEY PRESS, START DECAY LOOP
59 REM CHECK DURING LOOP TO SEE IF A KEY IS STILL PRESSED AND IF IT IS THE SAME KEY
60 LKP=K:FOR X=10 TO 0 STEP -1:SOUND 0,M(K),10,X:FOR D=1 TO 30:NEXT D:K=STICK(0):IF K=LKP THEN NEXT X
69 REM READ KEYBOARD AGAIN. IF KEY IS STILL THE SAME AT THE END OF DECAY WAIT FOR A NEW KEY TO BE PRESSED
70 NKP=STICK(0):IF NKP=LKP THEN 70
74 REM START SEQUENCE AGAIN
75 K=NKP:GOTO 55
79 REM CHORD ROUTINE. THIS IS THE SAME AS THE MULTIVOICE ROUTINE EXCEPT THE NOTE VALUES ARE DIFFERENT
80 K=STICK(0):L0=PADDLE(0):L1=PADDLE(1):L2=PADDLE(2):KC=PEEK(764):IF KC<>255 THEN 199
84 REM WATCH OUT FOR TWO KEYS BEING PRESSED AT ONE TIME GIVING A ZERO VALUE
85 IF K=0 THEN 80
89 REM IF NO KEY IS PRESSED TURN OF THE SOUND
90 IF K=15 THEN SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0,0,0:GOTO 80
100 SOUND 0,L(K),10,L0:SOUND 1,M(K),10,L1:SOUND 2,H(K),10,L2:GOTO 80
198 REM THROW AWAY THE FIRST ATARI KEYPRESS AND SET UP THE SCREEN FOR THE MENU LINES 200 TO 220
199 GET #1,NULL
200 GRAPHICS 17:SETCOLOR 4,5,4:SETCOLOR 2,11,6:? #6:? #6:? #6;" SIMPLE SYNTHESIZER":? #6:? #6
210 ? #6:? #6:? #6;"MULTIPLE VOICES---1":? #6:? #6;"1ST OCTAVE CHORDS-2":? #6:? #6;"2ND OCTAVE CHORDS-3"
215 ? #6:? #6;"PIANO OCTAVE 1----4":? #6;"PIANO OCTAVE 2----5":? #6;"PIANO OCTAVE 3----6"
219 REM MAKE SURE THE INPUT IS VALID AND PROCESS THE CHOICE
220 ? #6:? #6:? #6;" SELECT MODE (1-6)";:GET #1,C:IF C<49 OR C>54 THEN 200:FLAG=0
229 REM TURN OFF THE SCREEN AND LOAD THE CORRECT MATRIX VALUES FOR THE MODE SELECTED
230 POKE 559,0:GOTO 230+10*(C-48)
240 FLAG=0:RESTORE 510:GOTO 500
250 FLAG=1:RESTORE 610:GOTO 600
260 FLAG=1:RESTORE 710:GOTO 700
270 RESTORE 810:GOTO 800
280 RESTORE 910:GOTO 900
290 RESTORE 1010:GOTO 1000
299 REM DO CHORDS IF SELECTED OTHERWISE DO MULTIVOICE
300 ON FLAG=1 GOTO 80:GOTO 20
499 REM ALL OF THE PITCH VALUES ARE STORED AS DATA STATEMENTS AND READ UPON DEMAND
500 FOR X=1 TO 13:READ A,B,C:M(X)=A:L(X)=B:H(X)=C:NEXT X:GOTO 300
510 DATA 121,243,60,114,230,57,108,217,53,102,204,50,96,193,47,91,182,45,85,173,42,81,162,40,76,153,37
520 DATA 72,144,35,68,136,33,64,128,31,60,121,29
600 FOR X=1 TO 13:READ A,B,C:L(X)=A:M(X)=B:H(X)=C:NEXT X:GOTO 300
610 DATA 243,193,162,230,182,153,217,173,144,204,162,136,193,153,128,182,144,121,173,136,114,162,128,108
620 DATA 153,121,102,144,114,96,136,108,91,128,102,85,121,96,81
700 FOR X=1 TO 13:READ A,B,C:L(X)=A:M(X)=B:H(X)=C:NEXT X:GOTO 300
710 DATA 121,96,81,114,91,76,108,85,72,102,81,68,96,76,64,91,72,60
720 DATA 85,68,57,81,64,53,76,60,50,72,57,48,68,53,45,64,50,42,60,47,40
800 FOR X=1 TO 13:READ A:M(X)=A:NEXT X:GOTO 50
810 DATA 243,230,217,204,193,182,173,162,153,144,136,128,121
900 FOR X=1 TO 13:READ A:M(X)=A:NEXT X:GOTO 50
910 DATA 121,114,108,102,96,91,85,81,76,72,68,64,60
1000 FOR X=1 TO 13:READ A:M(X)=A:NEXT X:GOTO 50
1010 DATA 60, 57,53,50,47,45,42,40,37,35,33,31,29
```

TYPO TABLE

Variable checksum = 243534

Line num range			Code	Length
1	-	30	SL	502
40	-	60	CW	523
69	-	89	OK	520
90	-	210	AI	612
215	-	260	AP	521
270	-	600	WT	521
610	-	900	QW	521
910	-	1010	GW	143

PICK A CHORD



Your ATARI can play most of them

by KARL WIEGERS

Impressive sound-generating capabilities have been built into all ATARI computers. Four separate "voices" can be used to generate a wide variety of music and sound effects through the speaker in the television set. A special ATARI BASIC statement, the SOUND statement, is used to control the pitch, distortion, and loudness of each voice.

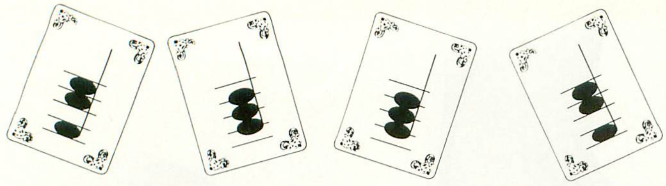
Since most chords commonly used in music involve only three to five separate notes, the four voices in the ATARI can be used in unison to play many different chords. The program which accompanies this article allows you to hear twelve different kinds of chords, in any musical key. This program can teach you a bit about musical chord structure and also how to use the sound-producing features of ATARI computers.

CHORD THEORY IN A NUTSHELL

There are really only twelve different musical notes: C, C# (or Db), D, D# (Eb), E, F, F# (Gb), G, G# (Ab), A, A# (Bb), and B. All other notes are formed by altering the pitch of one of these twelve by one or more octaves. Playing twelve notes in sequence constitutes a "chromatic scale." However, since you can start the scale at any one of the twelve notes, it follows that there are twelve different chromatic scales, each of which defines one of the twelve possible "keys" in which music can be played.

Chords are composed of certain notes selected from a particular chromatic scale. It is the "intervals" between the notes which give each chord its characteristic sound. The specific notes involved affect only the key the chord is played in, not the nature of the chord itself. For example, a major chord always consists of the 1st, 5th, and 8th notes in the chromatic scale for some key. For the key of C these notes are C, E, and G. In the key of F, a major chord (F major) contains the notes, F, A, and C. The intervals remain the same as the key changes, although the actual notes played will be altered. Changing

continued on next page



just one note in the chord can dramatically alter the sound of the chord and hence its auditory and emotional impact on the listener.

Let's return to the C major chord. There is nothing that says the lowest-pitched note in this chord must be a C. The notes can be played in any "inversion," or sequence of pitch. Some possibilities are (in order of increasing pitch): C, E, G; E, G, C; G, C, E; G, E, C; and any other sequence. If more than three notes are to be played, then one of these three must be repeated an octave (or several octaves) higher or lower. That is, the 17th note in the chromatic scale is the same as the 5th note, but is one octave higher in pitch. Adding any different notes will change the chord from C major to something else. Each inversion has its own particular sound, but the chord often sounds most characteristic when the lowest-pitched note is the first note in the scale.

ABOUT THE CHORD PROGRAM

The chord program shows you two menus, one for the key and one for the type of chord you wish to hear. There are only twelve possible keys, but there are many chords besides the dozen common ones included in this program. To select a chord, just enter the number for a key and then the number for the chord when the program prompts you. Any invalid entry will result in an obnoxious noise and a reminder to enter only numbers 1 through 12. The name of the chord you selected will be displayed, and arrows will appear next to the notes which constitute that chord. (If only three arrows appear, then the first note in the chromatic scale is being duplicated one octave higher by the fourth voice.) Then press [RETURN] to play another chord, or press [ESC] to quit using the chord program.

Be very careful to type in the program correctly, and SAVE it to cassette or diskette before running it for the first time. Count the spaces in lines 70 and 80 carefully, or the menus will look funny and you may get a BASIC error number 5 at line 230 when you run the program. It might help to remember that each key name occupies five characters in the MENU1$ array, while each chord name occupies six characters in MENU2$.

The DATA statements in lines 100–130 contain the numeric pitch values for the musical notes used by the program. These were taken from Table 10-1 of the *Atari BASIC Reference Manual*. Errors here will result in incorrect notes being played. Notice that the computer will create sounds if pitch values between the numbers in lines 100–130 are used, but the sounds will not correspond exactly to any note in the chromatic scale.

The DATA statements in lines 150–170 contain the notes of the chromatic scale which are to be sounded for each kind of chord. For example, the first four numbers in line 150 correspond to the notes in a C major chord: the 1st, 8th, 13th (same as 1st but one octave higher), and 17th (same as 5th but one octave higher) notes in the chromatic scale starting with C. You will hear a C, G, high C, and high E for a C major chord. You can add or substitute other chords for these twelve by modifying the appropriate numbers in lines 150–170 and changing the corresponding chord name in line 80. The table below gives the intervals for some other chords you might like to try.

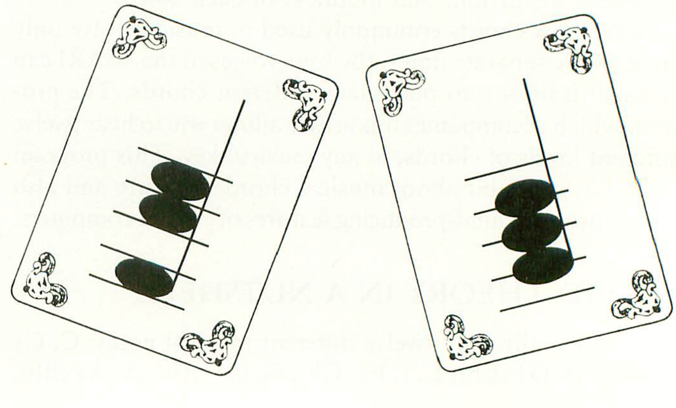
The DATA statements in lines 190–200 are a short machine language program called a "display list interrupt," or DLI (see ANTIC, June 1983, page 24). The DLI changes the color of the last five lines of the screen to orange with white characters, instead of green with black characters. If you don't like orange, change the 248 in line 190 to some other number. If you don't like green, change the SETCOLOR 2,12,8 statement in line 50. Typing errors in lines 190–200 may cause the computer to "lock up," so SAVE the program before running it the first time.

The rest of the program sets up the screen display, allows you to enter your chord selection, and plays the desired chord. Line 370 loads the correct pitch values into an array, and line 400 uses these values to activate the four voices. All four voices are sounded as pure tones (distortion = 10). When using several voices at once like this, the sum of all the loudness settings should not exceed 32, to avoid distortion of the sound. You may have to turn the volume on your TV set up a bit higher than normal, since the voices are all played at a loudness of only three for best sound quality. Line 410 plays the chord for about two second using an empty FOR/NEXT loop, then line 420 turns off all four voices.

If you want the chord to play continuously until you request a different one, then delete program lines 420–480 and change line 410 to GOTO 280. The resulting program turns your ATARI into a kind of chord organ. Try playing different sequences of chords, or "progressions," to see how they sound. You can even play songs now, but the rhythm is rather monotonous! Stop the sound and exit from the program by pressing [SYSTEM RESET].

Table 1. Additional Chords

CHORD	INTERVALS	CHORD	INTERVALS
7sus4	1,8,11,18	7#5	1,11,17,21
7#9	1,5,11,16	7b9	1,5,11,14
13th	1,11,17,22	min13	1,11,16,22
maj13	1,12,17,22	maj9	1,5,12,15
6/9	1,5,10,15	min6	1,8,10,16



Requires 16K RAM

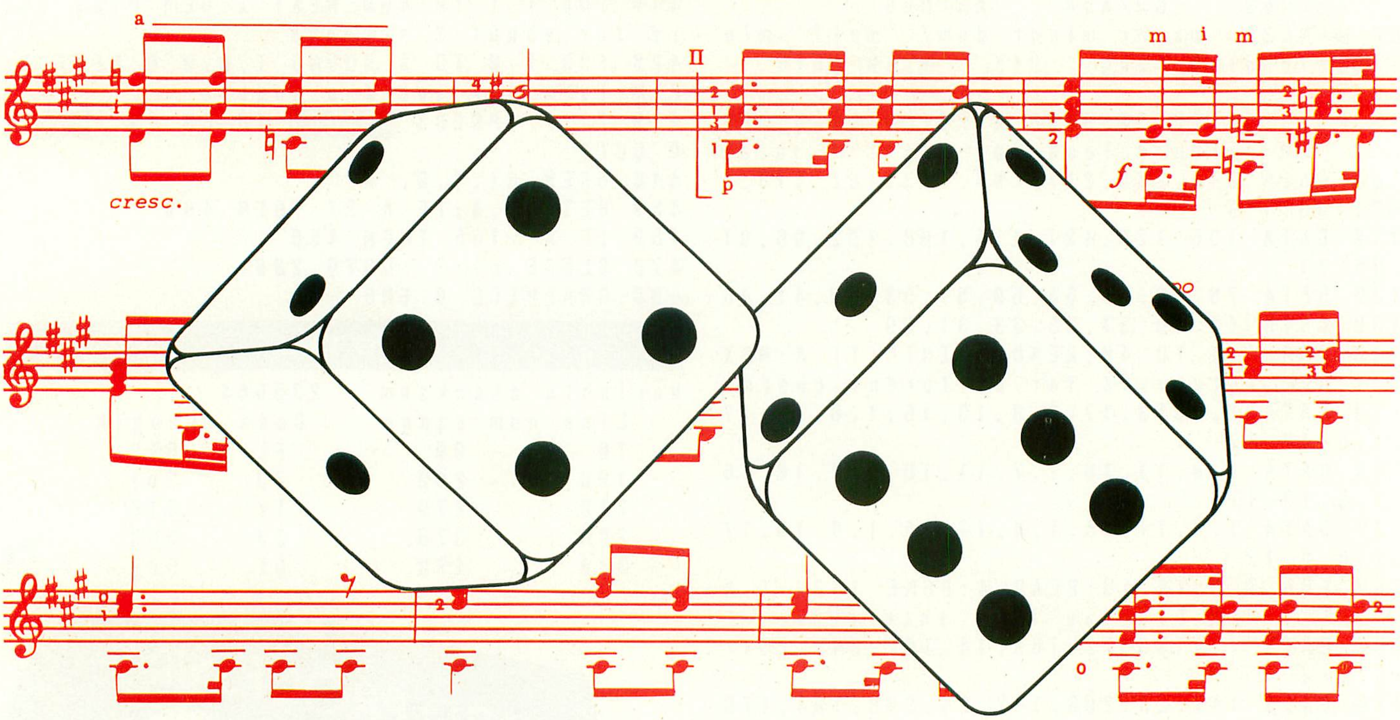
```
10 REM ......CHORD PROGRAM......
20 REM ......by Karl E. Wiegers.....
30 REM .....ANTIC MAGAZINE 1983......
40 DIM MENU1$(60),MENU2$(72),PITCH(37)
,INTS(48),N(4)
50 GRAPHICS 0:SETCOLOR 1,0,0:SETCOLOR
2,12,8:POKE 752,1
60 POSITION 5,2:? "ONE MOMENT, PLEASE.
..."
70 MENU1$="C    C#/DbD    D#/EbE    F
   F#/GbG    G#/AbA    A#/BbB    "
80 MENU2$="major minor dom7  maj7  min
7 min7b5dim7  aug   9th   min9  6th
sus4  "
90 FOR I=1 TO 37:READ A:PITCH(I)=A:NEX
T I:REM Pitch values for musical notes
100 DATA 243,230,217,204,193,182,173,1
62,153,144
110 DATA 136,128,121,114,108,102,96,91
,85,81
120 DATA 76,72,68,64,60,57,53,50,47,45
130 DATA 42,40,37,35,33,31,29
140 FOR I=1 TO 48:READ A:INTS(I)=A:NEX
T I:REM Intervals for different chords
150 DATA 1,8,13,17,1,8,13,16,1,8,11,17
,1,8,12,17
160 DATA 1,8,11,16,1,7,11,16,1,7,10,16
,1,9,13,17
170 DATA 1,5,11,15,1,4,11,15,1,8,10,17
,1,6,8,13
180 FOR I=0 TO 19:READ A:POKE 1536+I,A
:NEXT I:REM Display list interrupt
190 DATA 72,138,72,169,14,162,248,141,
10,212
200 DATA 141,23,208,142,24,208,104,170
,104,64
210 ? CHR$(125):REM Clear the screen
220 POSITION 10,2:? "KEY":POSITION 25,
2:? "CHORD"
230 FOR I=1 TO 12:POSITION 8-(I>9),3+I
:? I;". ";MENU1$(5*I-4,5*I)
240 POSITION 23-(I>9),3+I:? I;". ";MEN
U2$(6*I-5,6*I):NEXT I
250 POKE 703,4:REM Set up a text windo
w in this Graphics Mode 0 display
260 POKE (PEEK(560)+256*PEEK(561)+23),
130:REM Set DLI on line 18 of display
270 POKE 512,0:POKE 513,6:POKE 54286,1
92:REM Enable display list interrupt
280 TRAP 300:? "Enter a Key: ";:INPUT
KEY
290 IF KEY>0 AND KEY<13 THEN TRAP 4000
0:GOTO 310
300 ? "↖ENTER A NUMBER FROM 1-12":? :G
OTO 280:REM ESC CTRL-2 FOR ↖
310 POSITION 14,18:? #6;MENU1$(5*KEY-4
,5*KEY)
320 TRAP 340:? "Enter a Chord: ";:INPU
T CHORD
330 IF CHORD>0 AND CHORD<13 THEN TRAP
40000:GOTO 350
340 ? "↖ENTER A NUMBER FROM 1-12":? :G
OTO 320:REM ESC CTRL-2 FOR ↖
350 POSITION 20,18:? #6;MENU2$(6*CHORD
-5,6*CHORD)
360 FOR I=4 TO 15:POSITION 6,I:? #6;"
":NEXT I
370 FOR I=1 TO 4:A=INTS((CHORD-1)*4+I)
+KEY-1:N(I)=PITCH(A):REM Choose notes
380 POSITION 6,3+A-12*(A>12)-12*(A>24)
:? #6;CHR$(159):REM Draw arrows
390 NEXT I
400 FOR I=0 TO 3:SOUND I,N(I+1),10,3:N
EXT I:REM Here is the chord
410 FOR I=1 TO 400:NEXT I:REM Play cho
rd for about 2 seconds
420 FOR I=0 TO 3:SOUND I,0,0,0:NEXT I:
REM Turn off sound channels
430 ? :? "PRESS RETURN TO GO ON, ESC T
O QUIT"
440 OPEN #1,4,0,"K:"
450 GET #1,A:IF A=27 THEN 480
460 IF A<>155 THEN 450
470 CLOSE #1:? :GOTO 280
480 GRAPHICS 0:END
```

TYPO TABLE

Variable checksum = 235644

Line num range	Code	Length
10 - 90	FL	518
100 - 200	ZJ	507
210 - 270	TY	516
280 - 370	ZJ	563
380 - 480	QI	509

RANDOM MUSIC



Can an ATARI make a melody?

by CHARLES JACKSON

Can a computer generate melodies? It can make a series of notes, just as a bird can sing without producing a melody, but can even a bird generate a "good" melody? While considering such abstruse points, another question to ask is why anyone in their right mind would want to make a computer write melodies. Music is a form of human expression! One answer is that by simulating melodies, we might gain insight into what makes a melody, and knowing this we might be able to write better melodies.

You will be pleased to know that without buying additional plug-ins or other expensive equipment, without requiring musical ability beyond an interest in learning, and without an understanding of higher mathematics or physics, the built-in sound functions of the ATARI make it possible to answer these questions.

This article investigates ways that your ATARI can generate simple melodies. First, some short examples will show you how to generate random melodies. You can insert these short examples into programs or games that you have written. The "melodies" generated this way sound like ones in popular commercial games, like **Protector** by Synapse Software. However, let's be realistic from the start; the sounds from random music generation will never spice up your programs or games as much as Jerry White's **Music Box** from Program Design, Inc.

Listening to the short examples provides ideas for a second, more detailed way to generate melodies. Surprising results can be made by the random music generation routines described here; the melodies will never make the top ten, but some sound as good as "dentist's office music." (This may or may not be a real achievement.) Some of the internal workings of the more

---

Charles Jackson is a recent graduate of UCLA who bought his ATARI 800 to help him with class work (reports, calculations, etc.). He also discovered it could help him play four-part harmonies.

detailed program (Listing 1) are described at the end of the article, but try to use the program and listen to the types of melodies that you can generate before worrying about the technical aspects of random number generation.

The ATARI generates sound by the use of the BASIC command:

```
SOUND A,B,C,D
```

where A is the channel or voice (0–3), B determines the pitch (B = 0 to 255), C sets the tone quality (try 10 and 14 for pure tones and other even numbers less than 16 for special effects — especially 6,8,12), and D sets the volume (10 is typical). The frequency can be changed by poking a pitch value (B = 0 to 255) into locations 53760 for channel 0, 53762 for channel 1, 53764 for channel 2, and 53766 for channel 3.

By using either the built-in random number generator located at location 53770 or the BASIC command RND(X), one simple statement allows the generation of random melodies. Location 53770 always contains some number between 0 and 255, so it can easily be used in the ATARI sound command. The ATARI BASIC command RND(X), where X is a number or a variable, returns a decimal fraction between zero and one. As shown below, for use in a sound command RND(X) must be multiplied by a number less than or equal to 255.

The two random number generators can be demonstrated in short one-line programs:

```
1 SOUND 0,255*RND(0),10,10:WAIT=2^3:GOTO 1
1 SOUND 0,PEEK(53770),10,10:WAIT=2^3:GOTO 1
```

Enter the short one-line programs and listen to the melody. WAIT = 2^3 is just a way to make the notes go slower — try removing it! While you are at it, try changing the value of C to the even numbers between 0 and 16. By the way, hit the [BREAK] key to end the program.

The SOUND commands take a lot of computer time to execute, so if you want to insert a bit of random music into your programs without making a funeral march, a faster way of changing notes is needed. All you have to do is to start a note and then POKE a new one every now and then. First, turn on the sound in the program by using a SOUND command, for example:

```
1 SOUND 0,1,10,10.
```

Then enter your program. Somewhere in your program, perhaps in a FOR/NEXT loop or a statement that is used often, insert the following line:

```
XXX POKE(53760),PEEK(53770)
```

The XXX is whatever statement number you decide on, the PEEK value returns a random number, and the POKE location is for the pitch of voice number 0. If the music is too fast try placing the statement elsewhere, and if it moves too slowly, try inserting another statement.

One problem with this random music is that it doesn't even use the notes of the scale; it could even be called noise. Maybe choosing random musical notes (like hitting the keys of a piano at random) would sound better than choosing random pitches. Try this:

```
1 F=(2^(INT(24*RND(0))/12))/512:B=(1-2*F)/(2*F):
  SOUND 0,B,10,10: GOTO 1
```

(the complicated expressions for the pitch B choose notes on a piano keyboard).

This isn't very melodious, but it is an improvement musically. Also, the intervals are just too big. Most melodies are meant to be sung, but not many people can sing a very low note followed by a very high one. Restricting the range of notes improves the sound of the melodies, as Listing 1 shows.

One way to circumvent the problem of large intervals is to choose the intervals at random, rather than choosing the pitches at random. This way of choosing numbers describes the motion of a small particle in a liquid, called Brownian motion. It is also called a random walk: take a step or two, stop, choose a new direction at random, and take a few steps. Keep on repeating this until you are convinced that you are moving at random. Brownian motion describes many things, such as the prices on the New York Stock Exchange, and it can also generate melodies called brown music.

Another problem with these simple melodies is that all of the note values are the same, so there is no rhythm. Varying the rhythm would help make a more musical sound, but it leads to so many interesting possibilities that I have to leave it for you to investigate.

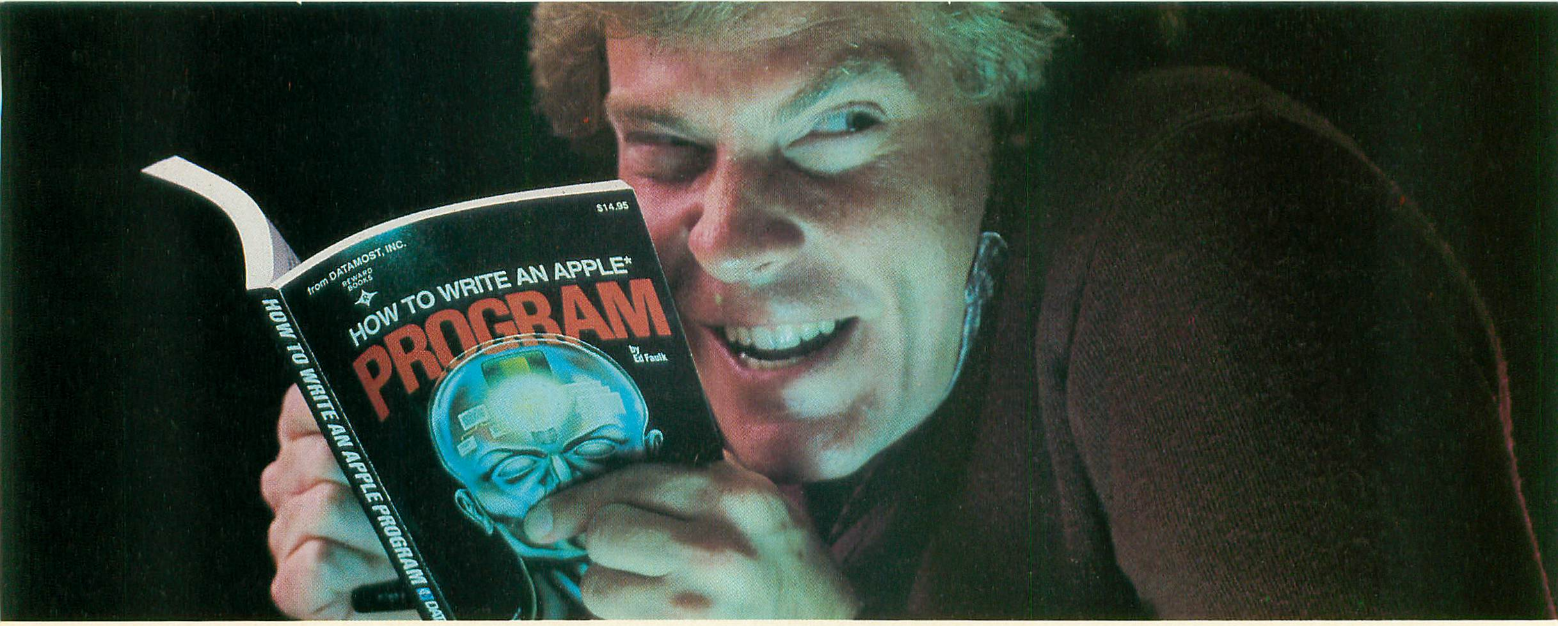
Finally, the melody goes nowhere. This is a fundamental problem with random music generation programs. Two physicists, Mandlebrot and Voss, have found that the way you generate random numbers can get around this fundamental problem. Mandlebrot and Voss call random music "white music" because a random series of colors is white to our eyes, so a random pattern of sounds should seem white to our ears. If you have a color TV set, turn it on to channel 3 with your ATARI turned off—notice the white (or grey) color? The static you hear is another form of white noise or music.

These two physicists from IBM have found that most music, from Ukrainian folk melodies to Indian sitar music, from classical music to rock 'n' roll, can be described as "1/F" (one-over-F) music. In their terms, 1/F music occurs between white music and brown music. 1/F music is easy for a computer to generate, as shown in Listing 1. Voss described a method for producing 1/F music in *Scientific American* in April 1978. While white music chooses pitches at random, and brown music chooses intervals at random, 1/F music chooses both pitches and intervals at random.

Listing 1 generates these types of music (white music, brown music, and 1/F music). The intervals can be modified and different scales can be heard by changing the DATA statements. You may wish to try using a different tempo (but it is hard to get each type of music to have the same tempo because the different subroutines take different times), or to modify the note durations or rhythms. The program shows a rough outline of the melody on the screen while the music is being played.

Even the 1/F music program is really quite short. To produce more complex computer-generated music would require

continued on page 53



Outsmart your computer.

Show your computer who's boss. Earn its respect. With a Datamost book.

No matter what age or ability level you're at, we have the right book that talks just to you. And your computer. Whether you own an Apple.* An Atari.* Or just about any brand.

All our books are incredibly easy to understand.

Which will make it incredibly easy to understand your computer.

What If You're Scared Of Books About Computers?

Don't be.

Our books are written in friendly, familiar American English. Highlighted with cartoons. And illustrations. So they're fun to read. As well as educational.

And there's over 30 books to choose from. Basic computer learning books to programming books to coloring books.

You won't be bombarded with complicated programming routines until you're ready for complicated programming routines. And no funny technical talk until you've reached level where you don't think it's funny.

We'll tell you what you need to know. And then, when that's understood, you can take the next step toward outsmarting your computer.

Before You Spend Big Bucks On A Computer, Spend Little Bucks.

Once you've decided, kind of, almost, nearly, what type of computer you think you'd like to buy, buy a Datamost book.

It'll help you understand the Atari or the Commodore* or the Apple of your eye.

Before you spend a lot of money. Before you take your computer home.

You'll make a better purchase decision. Because you'll understand what you're doing. And what you and your computer can do together.

So there won't be any misunderstandings to ruin your new relationship.

How To Get The Most Out Of Your Computer.

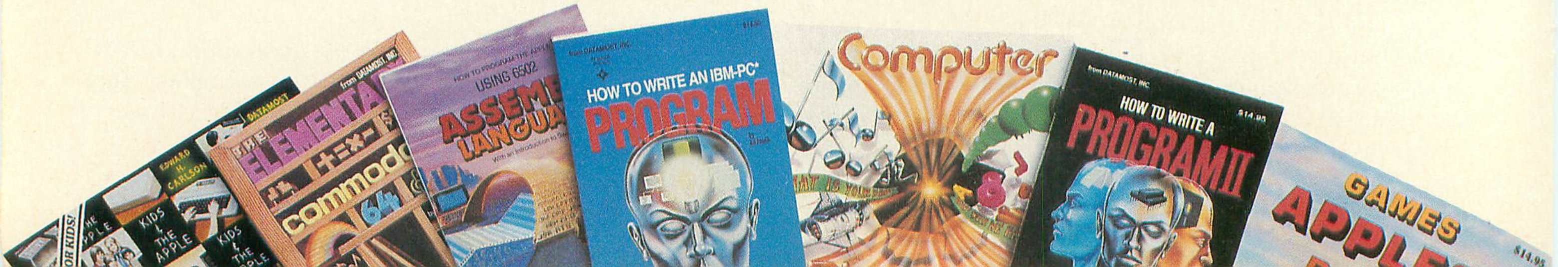
Get the most out of our minds.

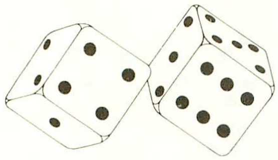
Datamost books for every computer. Everybody. Every level. Pretty smart, huh?

DATAMOST™ INC

The most out of our minds.™

Datamost, Inc., 8943 Fullbright Ave., Chatsworth, CA 91311, (213) 709-1202





RANDOM MUSIC *continued from page 51*

longer programs. One interesting example is the program for generating four-part harmony in the **Atari Music Composer** documentation. This program uses rules to assure good harmony, and it chooses notes at random until a good note turns up. (In other words, it generates white music and uses rules to make it more "musical".) It would be a large project, but using a 1/F note generator might make for a better sounding harmony.

After typing the program into your ATARI, try to decide which type of music is more musical. Can you tell one type of music from the other? Does the graph on the TV screen resemble the melody? Try the program on friends and see what they say. I'll leave these questions for you to answer — is the ATARI making music? Is it good music?

PROGRAM NOTES

The main features of the program are that the melody contour is displayed on the screen, and the tempo is made clearer with a click (or attack) generator. Finally, three types of scales can be used: the usual diatonic scale, in this case C major; the pentatonic scale, often used in folk melodies; and the harmonic scale, often called bugle notes. Pitches from the DATA statement with the lowest BASIC statement number will be played, so change the line numbers around if you want to hear different scales. Try your own scales, or even a short melody!

The 1/F generator was described in Martin Gardner's feature column in *Scientific American* in April of 1978. Imagine three colored dice — our program (Listing 1) uses seven. Initialize their values by rolling them all. Put them in order, blue, green, red. Give each color a binary digit. Let red be the units, green be the two's, and blue be the fours.

Keep count of the notes in binary form. When a binary digit changes from 0 to 1, or from 1 to 0, then roll the die associated with that digit. After each roll for a given note, add up the total of the dice to find which pitch is to be played.

Note #	Binary #	
0	000	Roll all three dice
1	001	Roll only red die
2	010	Roll green and red dice
3	011	Roll only red die
4	100	Roll all three dice
5	101	Roll only red die

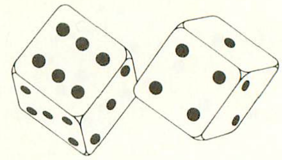
The above example shows how 1/F music is in between white music and brown music. Sometimes (notes number 0 and 4) all the dice are rolled and the new *note* is random in the sense of white music, and other times (notes number 1 and 5) only one die is rolled and the *interval* is random in the sense of brown music.

In Listing 1, there are seven dice. DICE(I) holds the binary bit for each die calculated in statement 325. OLDICE(I) is the binary bit from the last note. When a bit changes between OLDICE and DICE, then that die is rolled (statement 330), and VALDICE(I) is changed. The total of all the dice (statement 340) determines the pitch from array P(I). After each type of music is played, a GOTO 4000 statement leads to the final statement, which returns to Graphics 0 and lists the program. This last statement should help in your debugging stages, and it provides a long note to end the melody.

Requires 16K RAM

```
0 REM PROGRAM LISTING ONE
1 REM ANTIC MAGAZINE
5 GRAPHICS 3
10 DIM P(16),DICE(7),OLDICE(7),VALDICE
(7)
15 COLOR 1
20 FOR I=1 TO 16:READ P:P(I)=P:NEXT I
25 ? "TYPE OF MUSIC":? "1=WHITE; 2= BR
OWN; 3=1/F":INPUT TYPE:ON TYPE GOTO 10
0,200,300
45 REM SOUND AND PLOT
50 SOUND 2,12,10,14
55 SOUND 3,P(PIT),10,10
60 SOUND 2,0,0,0
65 PLOT I-40*INT(I/40),18-PIT
70 FOR WT=1 TO WAIT:NEXT WT
75 IF (I-40*INT(I/40))=39 THEN GRAPHIC
S 3
80 RETURN
100 REM WHITE MUSIC
105 FOR I=1 TO 128
110 PIT=1+INT(16*RND(1))
120 ? "WHITE MUSIC",PIT
130 WAIT=100
140 GOSUB 50
150 NEXT I
160 GOTO 4000
200 REM BROWN MUSIC
205 FOR I=1 TO 128
210 PIT=PIT-2+INT(5*RND(1))
215 IF PIT<1 OR PIT>16 THEN PIT=10
220 ? "BROWN MUSIC",PIT
230 WAIT=105
240 GOSUB 50
250 NEXT I
260 GOTO 4000
300 REM 1/F MUSIC
305 FOR J=1 TO 7:VALDICE(J)=INT(3*RND(
1)):DICE(J)=0:OLDICE(J)=0:NEXT J
310 FOR I=1 TO 128
315 PIT=0:NUM=I
320 FOR J=1 TO 7
325 DICE(J)=NUM-2*(INT(NUM/2)):NUM=INT
(NUM/2)
```

continued on next page



```
330 IF DICE(J)<>OLDICE(J) THEN VALDICE
(J)=INT(3*RND(1))
335 OLDICE(J)=DICE(J)
340 PIT=PIT+1+VALDICE(J)
345 NEXT J
350 ? "1/F MUSIC",PIT
355 IF PIT<1 OR PIT>16 THEN PIT=10
360 WAIT=1
365 GOSUB 50
370 NEXT I
375 GOTO 4000
3000 REM DIATONIC SCALE- C MAJOR
3005 DATA 162,144,128,121,108,96,91,81
,72,64,60,53,47,45,40,35
3010 REM PENTONIC SCALE
3015 DATA 243,217,182,162,144,121,108,
96,81,72,60,53,60,72,81,91
3020 REM BUGLE NOTES
3025 DATA 239,119,79,59,47,39,33,29,26
,23,21,19,16,14,14,13,12
4000 GRAPHICS 0:LIST :REM RETURNS TO G
R.0
```

TYPO TABLE

Variable checksum = 288560

Line num range	Code	Length
0 – 65	NY	408
70 – 200	NF	238
205 – 315	AP	313
320 – 375	PE	267
3000 – 4000	TN	276

THE GREATEST ATARI® GAME OF ALL TIME.

Object: Capture more programs than from any other source. Score: The best prices for programs win.

Actually, every member of CompuClub is a winner, because no one pays lower prices for Atari® programs than our members.

And no other source offers as many programs, with a descriptive catalog covering every piece of software we offer!

CompuClub has hundreds of Atari® programs: games, education and business. It's an astonishing selection, but just as incredible are our prices and our catalog.

Prices always at least 25% below retail

Fact is, usually our prices on selected programs are even lower than that. And we're always running sales with savings of at least 50% from the list price on some of your favorite programs.

And there are several ways to pay: MasterCard, Visa, or the ever popular check or money order.

Annotated catalog, updated every 45 days

We don't like to knock the competition, even by implication, but there are definite advantages to a CompuClub membership. One of the best of them is our catalog, which not only offers an unbelievable number of programs, but includes a description of each and every one of them.

In fact, the catalog is so big and filled with so much information that we print a separate price list. And we keep adding so many programs that we have to update the catalog nine times a year during the course of your membership.

Think of it! No more wondering what's behind the fancy label, no more shooting in the dark or depending on the word of a clerk who may not be familiar with the program you're interested in.

Exclusivity for Atari® owners

We're not trying to be all things to all people. We are definitely the best thing since the floppy disk for Atari® owners, and only Atari® owners. CompuClub is very exclusive.

Our catalog is thick with hundreds of Atari® programs, and only Atari® programs. No more fumbling your way through thickets of strange symbols and codes for the different computers everybody else's catalogs try to cover.

The rules

The rules are simple. To play the CompuClub "game," you've got to be a member. Anyone can join, as long as they fork over a mere five bucks, and agree to buy three programs during the year of membership. Order and buy your programs at any time during the year, but we're sure with our selection and prices that you'll want to get going right away.

Five dollars buys you a one-year membership, exclusive Atari® program offerings, a fully annotated catalog with 9 updates during the year, a current price list (and any necessary updates), a subscription to our newsletter, and discounted prices at all times, including announcements of our periodic sales, which feature savings of 50% off and more.

You can join by filling out the coupon below, or get an instant membership by calling our toll-free number and giving us your MasterCard or Visa identifying number. We'll forward your registration and sales order materials, your catalog and price list, so you can begin ordering right away.

That's all there is to it.

If you think you play a good game, you've got to join CompuClub. It's easy to play, and it saves you money.

We think it's the best Atari® game going, because with us, everybody wins.

CompuClub
Where Atari owners belong.

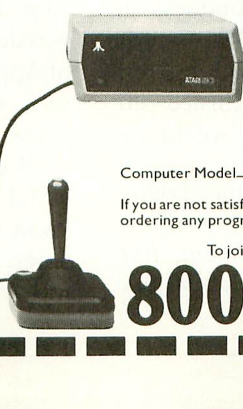


YES, **CompuClub,** PO Box 652, Natick MA 01760 **ATTN: Dept. AT**

I want to play the greatest Atari® game of all. Please enroll me in CompuClub for one year, and rush my registration material, catalog and price list to me. I agree to buy any three programs during the course of my year of membership. I have enclosed my payment of $5, or authorization to bill my charge card account.

Please make your check payable to CompuClub
Payment enclosed ☐ check ☐ money order.
Bill my ☐ MasterCard ☐ Visa ID #________

Expires________



Signature

Name

Address

City State Zip

Computer Model________ Disk ☐ Tape ☐

If you are not satisfied in any way with the conditions of your membership, you may cancel before ordering any programs from CompuClub. Your membership fee of $5 will be cheerfully refunded.

To join by phone, call toll-free.

800-631-3111

Please have your MasterCard or Visa card ready when you call. In Massachusetts, call 1-617-879-5232. We will forward your membership materials after confirming authorization for your charge.

SWEET TOOTS

Atari Logo sounds as good as it looks.

by KEN HARMS

Atari Logo presents a full array of sound controls — a clear advantage over the generally mute Apple Logos. This article explores Logo sound and presents a sound generating program. You can use this program and your joystick to set up unending combinations of sounds and see the commands needed to put them into your programs.

The ATARI computer probably has the most advanced sound generators built into any home computer. Four voices, modulations for special effects, and easy-to-use commands give the ATARI user full sound support. When Atari was designing Logo, they discovered that many people preferred a wider range of frequencies and greater sound precision over the four-voice feature. Therefore, Logo combines the four voices into two expanded, more controllable voices. And just to be sure you are not disappointed, an automatic "duration" command was added.

Under Logo, these voices are controlled by the TOOT primitive. TOOT requires four inputs — a *voice* (0 or 1), a *frequency* (a number between 14 and approximately 9000, which represents the cycles per second for the note) a *volume* (a number between 0 and 15), and a *duration* (a number between 1 and 255 giving the numer of sixtieths of a second which the sound will play). If you program in other Atari languages these will be familiar to you. One big difference is the frequency number — Logo gives you super precision and essentially unlimited range. The duration feature is new. No more timing loops! Instead, the Logo TOOT will play each note the exact time you give it while your program is off doing something else.

Like PILOT, Logo supports only the "pure" tones. Although it's a simple matter to develop new Logo commands to exercise the special effects, we'll leave that for another article. Logo compensates, however, by giving us a sound "envelope" command. Imagine a sound plotted on a graph with loudness on one axis and time on the other. The normal ATARI sounds are silent one instant, then full on (at whatever loudness you select) the next. They stay at full strength until turned off, which also occurs instantly. Most sounds in the world are not like this. A piano, for instance, starts at full loudness when the hammer strikes but rapidly tapers off to silence. Engineers call this "decay." Logo's SETENV command allows you to set simple decay rates independently for each of the two voices. Now, you can turn a computer sound into a piano sound with a single instruction!

Enough of the sales pitch! Let's look at the program. The "top level" procedure is START, naturally. It begins by clearing the screen with a "ClearText" command and follows by PRinting the headers. A series of MAKE commands sets up the variables we'll be using later. Logo uses two types of variables — "locals" which are defined in a procedure below the top level, and "globals" which are defined at the top level. Global variables operate in all procedures; locals don't. This means that a local variable name can be used in a second procedure and it won't have the value assigned to it previously. This is nice because you can then patch procedures together without worrying about conflicts. BUT, each time a sub-procedure sets up a local variable, it uses up space. Note the MAKE "X command in START. That variable is used in nine sub-procedures. When it was a local variable, the program did a "garbage collection" (i.e. stopped to reclaim unneeded space) every four cycles. After I defined it as a global variable at the top level, the program ran 31 cycles between collections!

Drop down a line or two. The (PR [\ \ ]. . . command illustrates how to get Logo to print a formatted line. The backslashes save a space, simple. To save exactly two spaces takes ingenuity — the [ ] gives one space in addition to the one space which Logo forces between all words.

The (PR CHAR 28. . . line illustrates printing graphic characters on the screen. The CHAR command outputs the character with the ASCII (decimal) value of its input (in this case, 28 is an arrow). Sometimes, you can see that our Logo was developed by people accustomed to the constricted world of Apples (which don't allow you to use the graphics character sets). Oh well, there were some compatibility advantages, I guess.

START yells for TOOTS which promptly reads JOYstick 0 and puts that value in the variable "X. I find it difficult to know when to use quotes and when a colon before a variable name. It boils down to something like this — when you want to put a value into a variable or to refer to it in general, use

continued on page 60

Our old department "PILOT Your ATARI" becomes Logo/PILOT with this issue. Ken Harms remains as our Contributing Editor and frequent author in this department, but contributions from others interested in these languages are welcome.



It sits on the sands of Egypt–silent, foreboding; the blue waters of the Nile sliding silently by. Pharoah's Pyramid beckons to us across millennia; mysterious, alluring. Where did the stones come from? How were they laid one on top of another? How many lives were lost under hot suns and cool moons to provide a resting place for the pharoahs of Egypt? Now you can have a personal stake in its completion. Match wits with the ancient Egyptian God, Osiris. Take advantage of gifts given you by the beautiful Isis. Fight through the plagues of Moses as brick by brick you build one of the wonders of the world. There hasn't been a greater challenge since the original Pharoah's Pyramid!

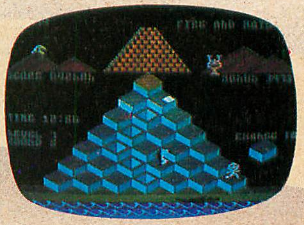
HISTORY PROVES THAT ALL GREAT GAMES HAVE THREE THINGS IN COMMON.



FAST-PACED FUN THAT LASTS



EVER INCREASING CHALLENGE



GRAPHICS THAT LIVE

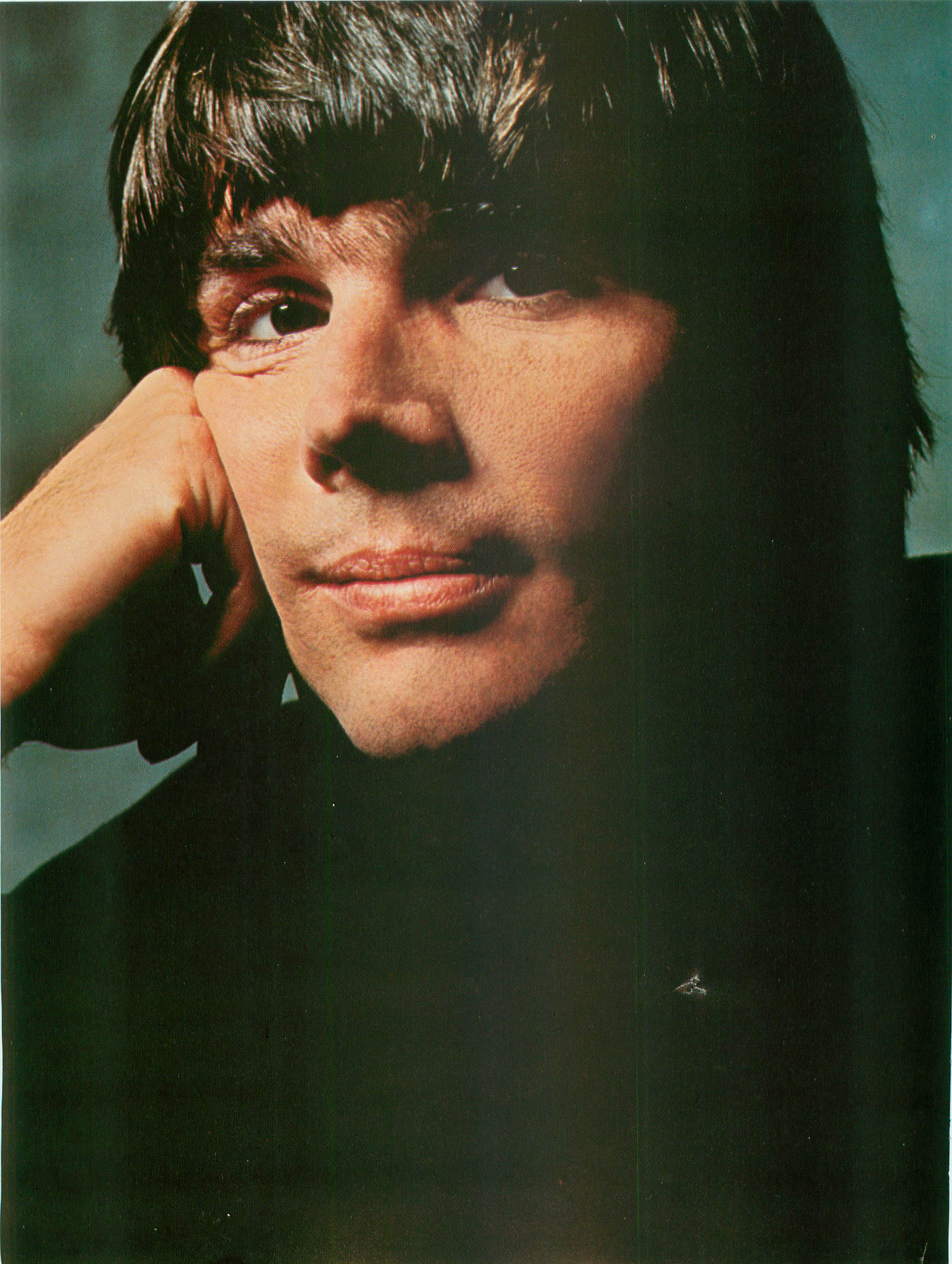
PHAROAH'S PYRAMID is a fast action game with that special kind of challenge that makes you say... "This time I go all the way!"

AVAILABLE NOW FROM... Master Control Software Inc.

Atari, Inc. is a registered trademark of Atari, Inc. and Commodore business machines.

The company that loves great games as much as you do, see your local dealer or call toll free. 1•800•624•5596

P.O. BOX 26714 • SALT LAKE CITY • UTAH • 84126



Bill Budge wants to write a program so human that turning it off would be an act of murder.

ARE YOU SURE YOU WANT TO CALL THIS GUY AN ARTIST?

IN A BEDROOM in a frame house in Berkeley, California, a guy who looks like he might have stepped out of a TV family series is playing with some ideas that could change your life. They are ideas that are amusing, even charming. And they are ideas that are, quite frankly, a little scary.

Bill Budge's classic PINBALL CONSTRUCTION SET is just one of more than a dozen remarkable publications by a company called Electronic Arts. We're an association of software artists, united by a common goal: we want to realize the potential of the home computer. To do this, we're creating software worthy not only of the capabilities of these machines, but also of the minds that use them. If you'd like to know more about our company and its products, call (415) 571-7171, or write us at 2755 Campus Dr., San Mateo, California 94403.

His name is Bill Budge and he talks about things like how programming for a microcomputer is like writing a poem using a 600-word vocabulary. He talks about how the elements are so limited and how you have to make them mean so much. And he talks about how, if you do it right, you can make those elements suggest something more than aliens—something that begins to make you believe it has a life of its own, something he calls "a software friend."

A software friend. It sinks in slowly.

To create a personality in the computer, you have to come to some decisions about what personality is in the first place. We often think of it in nearly the same way we think of "habit" or "character traits"—a way of describing continuity in our behavior from one moment to the next. (F. Scott Fitzgerald called it "a series of consistent gestures.")

According to Budge, however, the essence of a software friend is quite the opposite. "Creating the illusion of personality," he says, "means creating an intelligence that's always changing. It reacts differently to different situations."

The idea is probably ten years away from actuality. But when it comes to working such a mojo on our home computers, well, Budge stands about as good a chance as anyone of pulling it off.

After all, look at PINBALL CONSTRUCTION SET. Everyone always knew Budge was good, but when he cranked out PINBALL, well, the switchboard lit up like a Christmas tree.

It was a program that changed the way people thought about personal computers. Instead of reacting to the machine, you were suddenly inside it, trafficking information this way and that, making things. It was like programming, but with familiar items—you'd grab this bumper, move those flippers, change the colors, then shoot a ball through it all and wonder. Maybe for the first time in a popular program, you could feel the power of the computer.

Steve Wozniak called it "the best program ever written for an 8-bit machine." And suddenly, what-Budge-would-do-next was something you heard people talking about. To Budge himself, however, things weren't quite that simple.

"Sometimes I worry," he says. "I worry about the ability of software to absorb you, focus on you, steal you away from your family and friends. Because in its short-term excitement, it seems to be more interesting. Of course, it's not."

He leans on his hand. "Not yet."

ELECTRONIC ARTS™

PINBALL CONSTRUCTION SET is now available for Apple, Atari, and Commodore computers. To see it, and to receive a free "We See Farther" poster, stop by the authorized Electronic Arts dealer nearest you.

SWEET TOOTS *continued from page 56*

the quotes; when you want the *value itself* in the variable, use the colon. The explanation is in the manual but it requires careful reading.

The next line, IF :X = 6. . . , appears awkward. We didn't say IF JOY 0 = 6 because that doesn't seem to work. It is reasonable to expect that you could use the output of a primitive in an IF statement; but, you can't. Use a MAKE earlier, and then the IF.

The same line uses a new command, CHANGE. The power of defining new commands is what Logo is all about. I defined CHANGE (it's listed down below) to take any input value (in this case, :POINTER), increment it by a second number (−1), but, if the new number is less than a minimum (0) make it equal the maximum (7). Conversely, if the new number is greater than the maximum (7), CHANGE makes it into the minimum. Neatest, you can feed the CHANGE any set of values, increments, minimums and maximums. The command is used in nearly all the sub-procedures to make sure values for the TOOT and SETENV commands stay in range.

If the JOYstick isn't pulled left or right (values 6 or 2), TOOTS falls through to one of eight subprocedures used to set each variable in the sound system. Most of these are simple procedures and very repetitive — in fact, just type one and EDIT it to change the name and the variables.

The sub-procedures controlling frequency and duration (SETFRE0 and SETDUR0) illustrate the compound AND NOT operations to control program flow. That sequence says "IF the JOYstick is NOT pressed AND IF the value in variable X is 0, then . . ." It's easier than PILOT's linked conditionals, but placing the AND in front seems awkward. After learning the syntax, however, you can use it to link any number of conditions without typing AND over and over.

As a last tidbit for this column let's look over the CHANGE command. Notice that the "calling procedure," SETENV1 or whatever, gives the CHANGE command and a list of variables. In SETENV1, the first variable is :ENV1, the value to be put into the SETENV command. But when CHANGE starts, it calls that number :VAL. After operating on :VAL to produce :V, CHANGE outputs :V to the MAKE command in SETENV1 which then places it into the variable named "ENV1. Later, this value is used to set the envelope. This ability to pass variables without name conflicts is a powerful feature not found in BASIC or PILOT.

Next month we're in for a treat — a Player/Missile treatment to make PILOT's turtle visible!

```
TO TOOTS
MAKE "X JOY Ø
IF :X = 6 [MAKE "POINTER CHANGE :POINT
ER -1 Ø 7]
IF :X = 2 [MAKE "POINTER CHANGE :POINT
ER 1 Ø 7]
SHOWPOINTER
IF OR :X = 6 :X = 2 [TOOTS]
```

```
IF :POINTER = Ø [SETENVØ]
IF :POINTER = 1 [SETFREØ]
IF :POINTER = 2 [SETVOLØ]
IF :POINTER = 3 [SETDURØ]
IF :POINTER = 4 [SETENV1]
IF :POINTER = 5 [SETFRE1]
IF :POINTER = 6 [SETVOL1]
IF :POINTER = 7 [SETDUR1]
TOOTS
END
TO START
CT
SETCURSOR [3 5] PR [SET __TOOT Ø___ SE
T __TOOT 1___]
SETCURSOR [3 6] PR [ENV FRE VOL DUR EN
V FRE VOL DUR]
MAKE "ENVØ Ø MAKE "ENV1 Ø
MAKE "FREØ 2Ø MAKE "FRE1 2Ø
MAKE "VOLØ 1Ø MAKE "VOL1 1Ø
MAKE "DURØ 3Ø MAKE "DUR1 3Ø
MAKE "POINTER Ø MAKE "X Ø
SETCURSOR [Ø 8]
( PR [\ \ ] :ENVØ [\ ] :FREØ [] :VOLØ
[] :DURØ [] :ENV1 [\ ] :FRE1 [] :VOL1
[] :DUR1 )
SETCURSOR [9 14]
( PR CHAR 28 CHAR 29 [CHANGES VALUES]
)
( PR [\ ] [** HOLD BUTTON FOR FAST CHA
NGE **] )
SETCURSOR [8 17]
( PR CHAR 3Ø CHAR 31 [TO CHANGE FUNCTI
ON] )
TOOTS
END
TO SETENVØ
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
IF :X = Ø [MAKE "ENVØ CHANGE :ENVØ -1
Ø 1Ø]
IF :X = 4 [MAKE "ENVØ CHANGE :ENVØ 1 Ø
 1Ø]
SETENV Ø :ENVØ
SAYVALUES
TOOTER
SETENVØ
END
TO SETFREØ
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
IF AND NOT JOYB Ø :X = Ø [MAKE "FREØ C
HANGE :FREØ -1Ø 15 9ØØØ]
IF AND JOYB Ø :X = Ø [MAKE "FREØ CHANG
E :FREØ -1ØØ 15 9ØØØ]
IF AND NOT JOYB Ø :X = 4 [MAKE "FREØ C
HANGE :FREØ 1Ø 15 9ØØØ]
IF AND JOYB Ø :X = 4 [MAKE "FREØ CHANG
E :FREØ 1ØØ 15 9ØØØ]
SAYVALUES
TOOTER
SETFREØ
END
TO SETVOLØ
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
IF :X = Ø [MAKE "VOLØ CHANGE :VOLØ -1
Ø 15]
IF :X = 4 [MAKE "VOLØ CHANGE :VOLØ 1 Ø
 15]
SAYVALUES
TOOTER
SETVOLØ
END
TO SETDURØ
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
IF AND NOT JOYB Ø :X = Ø [MAKE "DURØ C
HANGE :DURØ -1 Ø 255]
IF AND NOT JOYB Ø :X = 4 [MAKE "DURØ C
HANGE :DURØ 1 Ø 255]
IF AND JOYB Ø :X = Ø [MAKE "DURØ CHANG
E :DURØ -1Ø Ø 255]
IF AND JOYB Ø :X = 4 [MAKE "DURØ CHANG
E :DURØ 1Ø Ø 255]
SAYVALUES
TOOTER
SETDURØ
END
TO TOOTER
TOOT Ø :FREØ :VOLØ :DURØ
TOOT 1 :FRE1 :VOL1 :DUR1
END
TO SAYVALUES
SETCURSOR [3 8] PR :ENVØ
SETCURSOR [7 8] PR :FREØ
SETCURSOR [11 8] PR :VOLØ
SETCURSOR [15 8] PR :DURØ
SETCURSOR [19 8] PR :ENV1
SETCURSOR [23 8] PR :FRE1
SETCURSOR [27 8] PR :VOL1
SETCURSOR [31 8] PR :DUR1
END

TO SETDUR1
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
IF AND NOT JOYB Ø :X = Ø [MAKE "DUR1 C
HANGE :DUR1 -1 Ø 255]
IF AND NOT JOYB Ø :X = 4 [MAKE "DUR1 C
HANGE :DUR1 1 Ø 255]
IF AND JOYB Ø :X = Ø [MAKE "DUR1 CHANG
E :DUR1 -1Ø Ø 255]
IF AND JOYB Ø :X = 4 [MAKE "DUR1 CHANG
E :DUR1 1Ø Ø 255]
SAYVALUES
TOOTER
SETDUR1
END
TO SETVOL1
MAKE "X JOY Ø
IF OR :X = 2 :X = 6 [TOOTS]
```

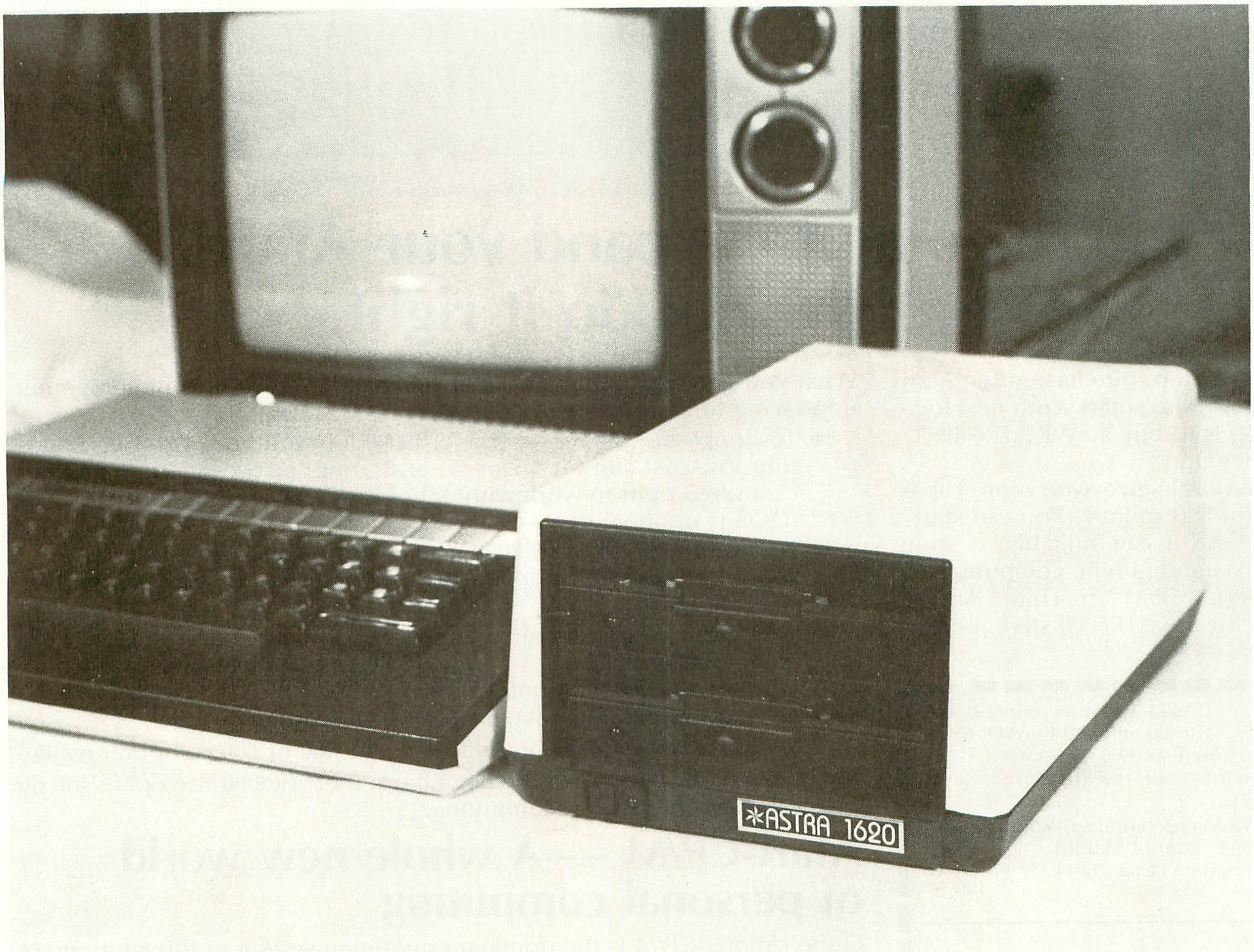
continued on next page

```
IF :X = 0 [MAKE "VOL1 CHANGE :VOL1 -1
0 15]
IF :X = 4 [MAKE "VOL1 CHANGE :VOL1 1 0
 15]
SAYVALUES
TOOTER
SETVOL1
END
TO SETFRE1
MAKE "X JOY 0
IF OR :X = 2 :X = 6 [TOOTS]
IF AND NOT JOYB 0 :X = 0 [MAKE "FRE1 C
HANGE :FRE1 -10 15 9000]
IF AND JOYB 0 :X = 0 [MAKE "FRE1 CHANG
E :FRE1 -100 15 9000]
IF AND NOT JOYB 0 :X = 4 [MAKE "FRE1 C
HANGE :FRE1 10 15 9000]
IF AND JOYB 0 :X = 4 [MAKE "FRE1 CHANG
E :FRE1 100 15 9000]
SAYVALUES
TOOTER
SETFRE1
END
TO SETENV1
MAKE "X JOY 0
IF OR :X = 2 :X = 6 [TOOTS]
IF :X = 0 [MAKE "ENV1 CHANGE :ENV1 -1
0 10]
IF :X = 4 [MAKE "ENV1 CHANGE :ENV1 1 0
 10]
SETENV 1 :ENV1
SAYVALUES
TOOTER
SETENV1
END

TO SHOWPOINTER
SETCURSOR [3 9]
PR [\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ ]
IF :POINTER = 0 [SETCURSOR [3 9]]
IF :POINTER = 1 [SETCURSOR [7 9]]
IF :POINTER = 2 [SETCURSOR [11 9]]
IF :POINTER = 3 [SETCURSOR [15 9]]
IF :POINTER = 4 [SETCURSOR [19 9]]
IF :POINTER = 5 [SETCURSOR [23 9]]
IF :POINTER = 6 [SETCURSOR [27 9]]
IF :POINTER = 7 [SETCURSOR [31 9]]
PR [^^^]
END
TO CHANGE :VAL :CHG :MIN :MAX
MAKE "V :VAL + :CHG
IF :V < :MIN [MAKE "V :MAX]
IF :V > :MAX [MAKE "V :MIN]
OUTPUT :V
END
```

LOOK WHAT WE HAVE FOR YOUR ATARI® HOME COMPUTER

More Disk Drive for your money. In fact, with the Astra 1620, you get **two** superb Disk Drives for the price of one. The Astra 1620 is single or Double Density (software selectable) and completely compatible with Atari Dos or OSA+ Dos. When used as Double Density the Astra 1620 has the same capacity as Four Atari 810® Disk Drives.



(7-7/8'' WIDE × 11-7/8'' DEEP × 5-7/8'' HIGH)

The ASTRA 1620 DOUBLE DENSITY – DOUBLE DISK DRIVE HAS A SUGGESTED LIST PRICE OF $595.00.

ASTRA SYSTEMS

5230 CLARK AVENUE • LAKEWOOD, CA 90712 • PHONE: (213) 804-1475



You're going to expand your Atari®... So why not do it right.

Your first step, purchase of an Atari 400 or 800, was smart. Your next logical step is to buy a SWP ATR8000™ interface unit.

An ATR8000 gives you more capability for less money. You can start small, but you can build big . . . from an outstanding home computer to a powerful CP/M™ machine. And prices for the ATR8000 start at only $349.95.

Yes . . . I'd like to know more about SWP's ATR8000 and CO-POWER-88 for my Atari 400/800 computer. Please rush me free literature.
Send to:
SWP Microcomputer Products, Inc.
2500 E. Randol Mill Rd. - 125
Arlington, Texas 76011

100

name ______________________

street address ______________________

city ________ state ________ zip ________

MAIL TODAY!

DEALER INQUIRIES INVITED.

SWP Inc MICROCOMPUTER PRODUCTS
2500 E. Randol Mill Rd
Arlington, Texas 76011
817/469-1181

We used to be Software Publishers, Inc.

What you get first, in the amazingly adaptable ATR8000, is plug-together interfacing to all ordinary system devices:

- To floppy disk drives — The ATR8000 lets you hook up from one to four low-cost add-on drives, 5″ or 8″, one- or two-sided, in any mix . . . and go right to work with either a single- or double-density DOS. (DOS is optional.)
- To a printer — The ATR8000 parallel "Centronics-interface" is supported by a ROM driver program that you can access from Atari Basic.
- To a modem, to a serial data terminal or to any other RS-232 communicating device — The comprehensive users manual includes an Atari Basic serial printer driver.
- To Atari peripherals such as the 810 Disk Drive.

And of course the ATR8000 interfaces to the 400 or 800 computer itself.

But system versatility is just the beginning; the ATR8000 also opens the door to another world of microcomputing.

Atari®-CP/M™ — A whole new world of personal computing

Quite simply, CP/M is the dominant operating system of the 8-bit microworld. Make the ATR8000 your first system expansion unit, and you can put the CP/M world in your own little jug.

Since the ATR8000 is actually a self-contained Z-80 computer, a low-cost upgrade converts your Atari-ATR8000 system into a full-capability CP/M machine. Of course you can also start right off with a CP/M-ATR8000. In either case, you get CP/M program-development capability, plus access to an enormous base of proven application programs that just load and go. The CP/M upgrade, which includes 64 Kbytes of RAM, costs just $249.95.

And it doesn't end there!

You can further upgrade your CP/M-ATR8000 to 16-bit microprocessing power . . . to CP/M-86 or MSDOS operation. Moreover, with SWP's CO-POWER-88™ upgrade, you not only retain your 8-bit processing capability, but you also can use CO-POWER-88 RAM — up to 256 Kbytes — as fast, simulated disk storage for CP/M operation.

Like the ATR8000, CO-POWER-88 comes with comprehensive documentation. Prices begin at $749.95 with 128 Kbytes of RAM and CP/M-86 operating system.



This Christmas, Atari and Commodore* owners will go out of their minds.

It'll take about 30 seconds.

Because once you boot a Datamost game on your Atari home computer, or your Commodore 64, you'll come face to screen with the most mind-blasting games ever.

And what better time to go out of your mind than Christmas?

Our Music Will Have You Hearing Things.

Going out of your mind never sounded so good.

Because now our games have music. You heard right. Music. Original Music. Throughout. And scored just for our newest releases. You'll go nuts over it.

Our Graphics Will Have You Seeing Things.

You and everybody else.

Because our games are so great-how great are they?-they're so great you'll want to play them again and again and again. And then your friends will go bonkers over them.

And they'll want to play. And then your family will want to play. And then total strangers off the street will want to play and...

Mind-blowing arcade-quality action like this makes it one mad world, pal.

We'll Torment You Right From The Start.

No time to settle down and get comfy.

The tension begins building the moment you boot the game.

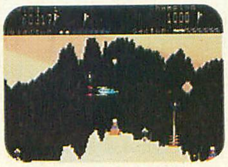
Terrific screen titles tease you with the game's objective, scenario, characters.

And while you wait, hand twitching over the Joystick, you'll find out what planet you're on.

What the fuss is all about.

Why you're involved. And perhaps of singular importance to you personally, how to keep from being obliterated. So get ready to get the most out of your mind.

By getting the most out of ours.



THE TAIL OF BETA LYRAE.™ Changes as you play. Unpredictable. Impossible to master. (No one has!)

DATAMOST™ INC

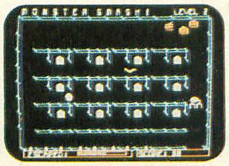
The most out of our minds.™

Datamost, Inc., 8943 Fullbright Ave., Chatsworth, CA 91311, (213) 709-1202

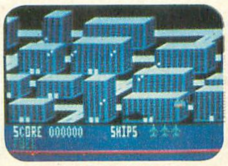
Atari is a trademark of Atari Computer. *Commodore 64 is a trademark of Commodore Business Machines, Inc. TM Registered Trademark of Datamost.



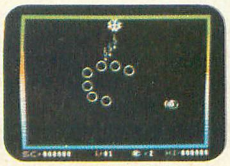
COSMIC TUNNELS.™ Four games in one. Four times the challenge! Incredible graphics.



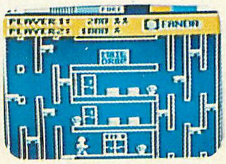
MONSTER SMASH.™ Deathly strategy. Mash the monsters! Let the visitors live.



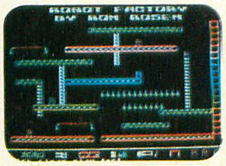
NIGHTRAIDERS.™ Strafe a city under siege with 3D angled selective firing!



ROUNDABOUT.™ Sharpens your shoot 'em up skills. 24 different game screens. Habit-forming!



COHEN'S TOWERS.™ You're the mailboy in a big city skyscraper. Work your way to the top.



MR. ROBOT.™ Screens scream with color, action and sound! Design your own screens, too.

These instructions could save your life.





Read this page very carefully before you play Star Trek Strategic Operations Simulator, the home video game that's so fast, so challenging, it comes with its own Combat Control Panel.

This is Star Trek as you've never played it before. Born in the arcade. Tested under fire. Then made even better. More challenging.

You fight Klingons and alien saucers throughout the galaxy. Maneuver through fields of space mines. And confront the ultimate enemy, Nomad. An enemy so powerful you'll need full phasers, warp speed and your Combat Control Panel to defeat him.

Star Trek. With the exclusive Star Trek Combat Control Panel. Don't leave Earth without it.

Made for:
Atari® 2600,™ Atari® 5200,™* Atari® Home Computers, Commodore 64™ and VIC-20,™ Texas Instruments 99/4A.™*

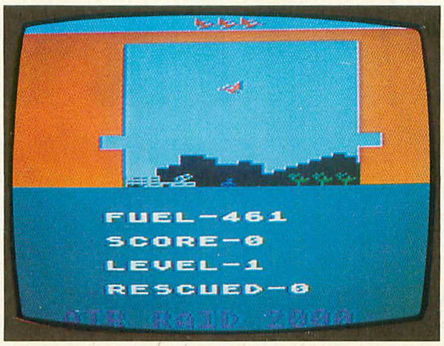
SEGA®
The Arcade Winners.

AIR RAID 2000

by ERIK WOLPAW

Requires 16K RAM with cassette or 24K RAM with disk

Air Raid 2000 is a fast-paced challenge for arcade game players. You pilot a plane that flies over scrolling terrain when enemy batteries are firing at you. You can bomb the enemy by pushing the fire button — as long as you fly above a minimum height indicated alongside the screen. Your real purpose in doing this is to rescue the four humans on the ground by dipping low enough to touch them with the plane.



When you have collected all four humans, prepare a place to land by bombing, and land your plane before your fuel runs out. This advances you to the next level.

After you type in the game, be sure to SAVE it before you RUN it. The screen will go blank for about 15 seconds for program initialization. Then you will see the final screen that says "Game Over." To play, press the fire button on the joystick in Port 1.

You start with one plane and have two in reserve. The ship is constantly in motion. You control its direction and vertical position with your joystick. You can control where bombs land after they are dropped by maneuvering horizontally. The marks at each side of the screen show the minimum height from which your ship can drop bombs. This height is raised with every wave.

When the ship's fuel reaches zero, the ship automatically initiates a landing in the direction it was travelling. You must clear a landing space or the ship will crash.

Every second wave is a night wave. During these waves, the ground can only be viewed when under the two spotlights.

Note to 1200XL owners: When Air Raid 2000 is run on an ATARI 1200XL, the screen display of the horizontal terrain is intermittently distorted. We apologize for this inconvenience.

Erik Wolpaw is a 16-year-old entering his junior year at Cleveland Heights High School. Although he has been interested in game programming for about two years, this is his first published game.

```
10 REM *** AIR RAID-2000 *** ANTIC MAGAZINE***
20 REM ***** 1983 E.F.WOLPAW ***
30 DIM B$(200),E$(5),OC$(3):Y=5
40 GOSUB 550:GOSUB 1030:GOSUB 1090:GOSUB 1180:SH=3
50 GS=1:EL=0:FU=500:S=1:Y=5:L=0:GOSUB 810
60 J=STICK(0):IF J<>7 AND J<>11 THEN 80
70 GD=(J=7)-(J=11)
80 IF J<>13 AND J<>14 THEN R=PEEK(SR+10+GD+(20*Y)):IF R<>0 AND R<>232 THEN 1150
90 IF J<>13 AND J<>14 THEN DY=0:GOTO 110
100 POKE SR+10+(20*Y),0:DY=(J=13)-(J=14):R=PEEK(SR+10+(20*(Y+DY))):IF R<>0 AND R<>232 OR Y+DY=13 THEN 1150
110 IF R=232 THEN 520
120 FU=FU-1:POSITION 5,15:? #6:"FUEL-";FU;"   ":IF FU=0 THEN 400
130 Y=Y+DY:POKE SR+10+20*Y,172-GD:IF STRIG(0)<>0 AND M=0 THEN 170
140 IF M=1 THEN 290
150 IF Y>HI THEN 170
160 MY=Y+1:POKE SR+10+20*MY,234:M=1:GOTO 290
170 S=S+GD:IF S+9>LEN(B$) THEN S=S-1
180 IF S/6=INT(S/6) AND S<>0 THEN LX=LX-GD:FOR I=0 TO 3:POKE 53248+I,LX+(I*24):NEXT I
190 CH=CH+1:CH=CH-2*(CH=3):IF S<1 THEN S=S+1
200 IF BE<>0 THEN GOSUB 350
210 IF LI=0 THEN SETCOLOR 4,8,INT(FU/33)
220 POSITION 6,12:? #6;B$(S,S+9):POKE
```

AIR RAID 2000 *continued from page 67*

```
756,PEEK(1Ø6)+4+(6*(CH=2))
23Ø IF B$(S+4,S+4)<>"$" AND EM=Ø THEN
6Ø
24Ø SOUND 3,4Ø+(EY*2),8Ø,14:IF EM=Ø TH
EN EM=1:EX=1Ø:EY=11:ES=GD
25Ø IF EX=1Ø AND EY=Y THEN POKE SR+EX+
2Ø*EY,Ø:GOTO 115Ø
26Ø POKE SR+EX+2Ø*EY,Ø:EY=EY-1:EX=EX+E
S*(GD<>ES):IF EX=15 OR EX=6 OR EY=1 TH
EN EM=Ø:SOUND 3,Ø,Ø,Ø:GOTO 6Ø
27Ø IF EX=1Ø AND EY=Y THEN 115Ø
28Ø POKE SR+EX+2Ø*EY,139:GOTO 6Ø
29Ø R=PEEK(SR+1Ø+(2Ø*(MY+1))):IF R<>Ø
AND R<>139 OR MY=12 THEN B$(BO,BO)=" "
:GOSUB 31Ø:GOTO 17Ø
3ØØ POKE SR+1Ø+2Ø*MY,Ø:MY=MY+1:POKE SR
+1Ø+2Ø*MY,17Ø:GOTO 17Ø
31Ø DATA ',*,),*,',(
32Ø RESTORE 31Ø:B$(S+4,S+4)=" ":POKE S
R+1Ø+2Ø*MY,Ø:M=Ø:BO=S+4:BE=Ø:M=Ø:SOUND
 Ø,2Ø,Ø,14:SOUND 1,255,1Ø,15
33Ø SC=SC+5Ø*(R=3 OR R=6)+2Ø*(R=1 OR R
=5)+5*(R=119 OR R=12Ø OR R=121)+15*(R=
4)
34Ø POSITION 5,17:? #6;"SCORE-";SC:IF
R=232 THEN SH=1:GOTO 115Ø
35Ø IF LI=1 THEN SETCOLOR 4,1,14
36Ø IF BE=2 THEN SOUND Ø,Ø,Ø,Ø:SOUND 1
,Ø,Ø,Ø
37Ø BE=(BE+1):READ E$:B$(BO,BO)=E$:IF
BE<>5 THEN RETURN
38Ø B$(BO,BO)=" ":IF LI=1 THEN SETCOLO
R 4,Ø,Ø
39Ø BE=Ø:SOUND Ø,Ø,Ø,Ø:SOUND 1,Ø,Ø,Ø:G
OTO 17Ø
4ØØ IF MA<>Ø THEN 115Ø
41Ø IF Y<12 THEN POKE SR+1Ø+2Ø*Y,Ø
42Ø SOUND 3,Ø,Ø,Ø:PO=PO+1:SOUND 2,9+PO
,64,15
43Ø Y=Y+1:Y=Y-(Y>12):POKE SR+1Ø+2Ø*Y,1
72-GD
44Ø S=S+GD:IF HIT=Ø THEN L=L+1:IF L=2Ø
 THEN SOUND 2,Ø,Ø,Ø:GOTO 135Ø
45Ø IF S/6=INT(S/6) THEN LX=LX-GD:FOR
I=Ø TO 3:POKE 53248+I,LX+(24*I):NEXT I
46Ø IF S>1 AND S+9<LEN(B$) THEN 49Ø
47Ø IF HIT=1 THEN 121Ø
48Ø IF HIT=Ø THEN 115Ø
49Ø POSITION 6,12:? #6;B$(S,S+9):IF Y=
12 AND HIT=Ø THEN R=PEEK(SR+1Ø+2Ø*12):
IF R<>Ø THEN 115Ø
5ØØ IF HIT=1 THEN IF Y=12 THEN 121Ø
51Ø GOTO 41Ø
52Ø MA=MA-1:B$(S+3,S+5)="   ":POKE SR+
1Ø+2Ø*12,Ø:Y=11:SOUND 1,6Ø,1Ø,15:FOR T
=1 TO 2Ø:NEXT T:SOUND 1,68,1Ø,15
53Ø POSITION 5,21:? #6;"RESCUED-";4-MA
54Ø FOR T=1 TO 3Ø:NEXT T:SOUND 1,Ø,Ø,Ø
:GOTO 17Ø
55Ø DATA 8,96,152,84,52,24,255,153,255
,24,Ø,255,165,255,165,255,165,131
56Ø DATA 32,Ø,Ø,Ø,Ø,254,19Ø,23Ø,23Ø,4Ø
Ø,Ø,Ø,Ø,Ø,Ø,Ø,85,255,48,Ø,24Ø,144,24Ø,
144,255,153,249
57Ø DATA 88,129,66,36,24,24,36,66,129,
44Ø,8Ø,16Ø,72,74,6Ø,16,16,16
58Ø DATA 56,Ø,Ø,Ø,Ø,24,24,24,24,64,Ø,Ø
,Ø,Ø,Ø,Ø,24,24,72,24,126,255,153,24,24
,24,24,8Ø,24,6Ø,6Ø,24,24,24,24,24
59Ø DATA 448,Ø,8,22,25,78,116,84,68,45
6,2,15,73,167,211,114,34,34,464,255,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
6ØØ DATA 32Ø,Ø,Ø,Ø,24,84,56,16,4Ø
61Ø DATA 336,Ø,Ø,16,12,16,Ø,Ø,Ø,344,12
8,192,248,228,255,56,112,Ø,36Ø,1,3,31,
39,255,28,14,Ø
62Ø DATA 96,255,255,255,255,255,255,25
5,255
63Ø DATA 4Ø,Ø,Ø,255,17Ø,17Ø,17Ø,17Ø,17
Ø
64Ø DATA -1
65Ø POKE 1Ø6,PEEK(1Ø6)-6:GRAPHICS 17:S
TART=PEEK(1Ø6)*256:POKE 752,1:RESTORE
55Ø
66Ø READ X:IF X=-1 THEN 68Ø
67Ø FOR Y=Ø TO 7:READ Z:POKE X+Y+START
,Z:NEXT Y:GOTO 66Ø
68Ø POKE 1Ø6,PEEK(1Ø6)-6:START=PEEK(1Ø
6)*256:RESTORE 71Ø
69Ø READ X:IF X=-1 THEN POKE 756,PEEK(
1Ø6)+6:RETURN
7ØØ FOR Y=Ø TO 7:READ Z:POKE X+Y+START
,Z:NEXT Y:GOTO 69Ø
71Ø DATA 8,12,5Ø,84,88,48,255,153,255,
24,Ø,255,165,255,165,255,165,131
72Ø DATA 32,Ø,Ø,Ø,Ø,254,19Ø,23Ø,23Ø,4Ø
Ø,Ø,Ø,Ø,Ø,Ø,Ø,17Ø,255,48,Ø,24Ø,144,24Ø
,144,255,153,249
73Ø DATA 88,Ø,Ø,231,24,24,231,Ø,Ø,44Ø,
8Ø,16Ø,72,74,6Ø,16,16,16
74Ø DATA 56,Ø,Ø,Ø,Ø,24,24,24,24,64,Ø,Ø
,Ø,Ø,Ø,Ø,24,24,72,24,126,255,153,24,24
,24,24,8Ø,24,6Ø,6Ø,24,24,24,24,24
75Ø DATA 448,Ø,8,22,25,78,116,84,68,45
6,2,15,73,167,211,114,34,34,464,255,Ø,
Ø,Ø,Ø,Ø,Ø,Ø
76Ø DATA 32Ø,Ø,Ø,Ø,24,16,56,84,4Ø
77Ø DATA 336,Ø,Ø,Ø,28,Ø,Ø,Ø,Ø,344,128,
192,248,228,255,56,112,Ø,36Ø,1,3,31,39
,255,28,14,Ø
78Ø DATA 96,255,255,255,255,255,255,25
5,255
79Ø DATA 4Ø,Ø,Ø,255,17Ø,17Ø,17Ø,17Ø,17
Ø
8ØØ DATA -1
81Ø B$="rrrr!##&! h  wwwx$y h yywxxwy&
!#  wy  yxy  xy$ w&$ $# ! $$$ xw h xxy
wyxxwxww$$$ h $   !xw yw  !rrrrr"
82Ø IF W<2 THEN 84Ø
```

continued on next page

```
830 B$="rrrr!$$ wywwxh$$$$$ $$$h$&$$$
wx$$&$$wxh$$$$!$$ $$!$$$$$$$$ wxx$ $$
& ## $$$$$ $!$h$$ xwy$$$#&$rrrrr"
840 GD=1:POKE 82,0:BO=10:EM=0
850 FOR T=1 TO 12:POSITION 0,T:? #6;".
......":POSITION 16,T:? #6;".....":NEXT
T:POSITION 0,1:? #6;"....................
"
860 POSITION 0,1:? #6;"................
...."
870 W=W+1:GOSUB 940:HI=10-W:IF HI<1 TH
EN HI=1
880 MA=4:POSITION 5,HI:? #6;" ":POSITI
ON 16,HI:? #6;" "
890 POSITION 5,21:? #6;"RESCUED-";4-MA
900 FOR I=0 TO 3:POKE 53248+I,95+(I*24
):NEXT I
910 POSITION 5,17:? #6;"SCORE-";SC;"
  ":POSITION 5,19:? #6;"LEVEL-";W;"
 ":LX=95
920 IF LI=0 THEN SETCOLOR 0,0,10:SETCO
LOR 1,12,6:SETCOLOR 3,7,6:SETCOLOR 2,3
,6:RETURN
930 RETURN
940 DATA 0,6,7,7,15,31,31,31,127,255,2
55,0,0,128,200,252,252,252,255,255,255
,255,0,2,7,15,31,63,127,255,255,255
950 DATA 255,0,0,128,192,224,224,224,2
25,243,255,255
960 DATA 0,0,0,0,0,0,0,0,0,0,0,30,16,1
6,56,56,124,124,124,124,124,124
970 DATA 30,16,16,56,56,124,124,124,12
4,124,124,0,0,0,0,0,0,0,0,0,0,0
980 IF W/2=INT(W/2) THEN RESTORE 960:L
I=1:SETCOLOR 0,0,0:SETCOLOR 1,0,0:SETC
OLOR 2,3,6:SETCOLOR 3,0,0:SETCOLOR 4,0
,0:GOTO 1000
990 RESTORE 940:LI=0:SETCOLOR 4,8,12
1000 FOR H=0 TO 3:READ C:POKE 704+H,C
1010 FOR I=START+512+PY+(128*H) TO STA
RT+521+PY+(128*H):READ Z:POKE I,Z:NEXT
 I:NEXT H
1020 RETURN
1030 X=95:PY=58
1040 A=PEEK(106)-4:POKE 106,A:POKE 542
79,A:START=256*A:POKE 559,46:POKE 5327
7,3
1050 FOR I=START+512 TO START+1024:POK
E I,0:NEXT I
1060 FOR H=0 TO 3:POKE 53248+H,X+(H*24
):POKE 53256+H,3
1070 NEXT H
1080 POKE 623,4:RETURN
1090 DLIST=PEEK(560)+PEEK(561)*256:POK
E DLIST+17,134:RESTORE 1100:FOR I=1536
 TO 1562
1100 DATA 72,169,6,141,10,212,141,26,2
08,169,14,141,22,208,169,224,141,9,212
,173,122,210,141,24,208,104,64
1110 READ X:POKE I,X:NEXT I:POKE 512,0
1120 POKE DLIST+28,7:POSITION 3,23:? #
6;"AIR RAID 2000"
1130 POKE 513,6:POKE 54286,192:SR=PEEK
(88)+256*PEEK(89)
1140 RETURN
1150 GOTO 1190
1160 POKE SR+EX+20*EY,0
1170 POKE SR+10+20*Y,0
1180 POSITION 9,0:? #6;"KKK":GOTO 1350
1190 SH=SH-1:POSITION 9+SH,0:? #6;" "
1200 PO=0:HIT=1:GOTO 410
1210 HIT=0
1220 DL4=DLIST+4:DL5=DLIST+5:NUML=PEEK
(DL4):NUMH=PEEK(DL5):PO=-20
1230 POSITION 10,Y:? #6;" ":IF EM=1 TH
EN POSITION EX,EY:? #6;" "
1240 FOR T=1 TO 32:CO=INT(RND(1)*16)+1
:SETCOLOR 4,CO,2
1250 F=F+1:IF F>4 THEN F=1
1260 PO=(F=1)-(F=2)-(F=3)+(F=4)
1270 NUML=NUML+PO:POKE DL4,NUML:POKE D
L5,NUMH
1280 SOUND 0,200,4,15:SOUND 1,255,4,15
:SOUND 2,225,4,15:SOUND 3,150,4,15:NEX
T T:FOR T=0 TO 3:SOUND T,0,0,0:NEXT T
1290 EM=0:FU=500:Y=5
1300 S=S+(S<1)-((S+9)>LEN(B$))
1310 IF LI=0 THEN SETCOLOR 4,8,10
1320 IF LI=1 THEN SETCOLOR 4,0,0
1330 IF SH=0 THEN 1160
1340 GOTO 170
1350 GOSUB 1360:SC=0:W=0:S=1:GOTO 50
1360 IF SH<>0 THEN POP :GOTO 50
1370 POSITION 3,23:? #6;"AIR RAID 2000
  ":IF SC>HI THEN HI=SC
1380 POKE 77,254:IF STRIG(0)=1 THEN PO
SITION 5,15:? #6;"GAME OVER  ":GOTO 13
80
1390 SH=3:POKE 77,0
1400 RETURN
```

TYPO TABLE

Variable checksum = 984146

Line num range	Code	Length
10 - 100	PL	616
110 - 190	IU	502
200 - 260	AU	518
270 - 330	XR	594
340 - 420	WM	552
430 - 510	AP	500
520 - 570	NA	531
580 - 660	HN	512
670 - 740	WZ	540
750 - 830	KB	526
840 - 910	TE	603
920 - 980	RK	607
990 - 1090	NE	528
1100 - 1210	TL	509
1220 - 1280	BQ	516
1290 - 1400	LI	481

PUBLIC DOMAIN SOFTWARE

ANTIC is pleased to offer a library of Public Domain Software for the ATARI computers currently comprised of 12 disks.These programs are not yet available on cassette. These disks contain unprotected material from the libraries of ATARI users' groups from around the country.

The potential buyer should note that these programs are sold *as is*. Their usefulness may depend on your experience with the computer. They may contain programming quirks that require some modification. However, all perform reasonably well. Contents of the disks may vary slightly from the published description due to unforeseen circumstances, but each disk is filled to reasonable capacity with useful programs of the kind described, and represent an excellent value at $10.00 each, plus $1.50 per order for shipping/handling. Send check or money order (payable to ANTIC Publishing), and disk number(s) to: **Public Domain Software, 600 18th Street, San Francisco, CA 94107.** Allow four weeks for delivery. All orders are sent by First-Class Mail. Please add 6½% sales tax for California residents.

ANTIC GAMES DISK #1

1. Chicken: a great game from ANTIC V.1, No.1
2. Hangman: the traditional word game
3. Creation: a version of Life
4. Reverse: order of string numbers
5. Monopoly: computerized!
6. Lunar lander: select terrain (stick)
7. Zonex: hidden color patterns in grid
8. Clewso: detective adventure, graphics

ANTIC GAMES DISK #2

1. Speed Demon: from ANTIC V.1 No.4
2. Guy' Grid Game
3. Deathstar: from ANTIC V.1, No.2
4. Blackjack: Vegas rules
5. Civil War: a strategic simulation
6. Artillery: firing strategy game
7. Super Wumpus: text adventure

ANTIC GAMES DISK #3

1. Petals
2. Showdown
3. FROG: from ANTIC V.1, No.3
4. Draw: Guy Hurt
5. Plus Zero
6. Collisi, and more

ANTIC GAMES DISK #4

1. Vultures: from Stan Ockers
2. Castle Hexagon: also by Stan Ockers
3. Adventure: The remainder of the disk contains an adventure game program which you can play, or you can use the program to write your own adventure. Instructions included in program.

ANTIC GAMES #5

1. Bats: who else? Stan Ockers, from ANTIC V.1, No.5
2. Steller Defense: from ANTIC V.1, No.6, slightly improved.
3. Yahtzee
4. Mastermind
5. Hamurabi: the classic simulation
6. Slalom: become a master schusser
7. Couch: analyze yourself
8. Aceyducy & more

ANTIC PHOTO GRAPHICS

Digitized Photos

ANTIC UTILITY DISK #1

1. Doc: program allows you to accompany programs with separate documentation on disk
2. Microassembler: allows you to create USR routines-assembler, more
3. Assembler-Editor: BASIC, slow but versatile
4. Num: automatic line numbering utility in BASIC
5. Memtest: runs without BASIC cartridge, to test all memory
6. Color: 128 colors at once
7. Printnop: connect parallel printer from jacks 3 & 4

ANTIC UTILITIES DISK #2

1. Bubble Sort: from ANTIC V.1, No.4
2. Typo: from ANTIC V.1, No.3
3. Home inventory
4. KEY 6: Cipher coding
5. Renumber
6. Compare: listings for differences
7. SUPER: menu
8. Modem
9. RT clock & more

ANTIC UTILITIES DISK #3

1. Disassembler: from ANTIC V.2, No.1
2. Tiny Text: from ANTIC V.1, No.6
3. GTIA text window: from ANTIC V.2, No.1
4. Label: disk label on Epson
5. Set up printer: sets up MX80 for Visicalc
6. Keyboard: tutorial & more

ANTIC GRAPHICS DEMO #1

1. Spider: from ANTIC V.1, No.3
2. Rainbow
3. Horses
4. ATARI logo
5. Oxygen
6. Spiral
7. Pretty
8. Message and more

ANTIC MUSIC DISK #1

Requires Music Composer Cartridge

1. Prelude
2. Joplin
3. In My Life
4. Star Trek
5. Daisy
6. Greensleeves
7. Yellow Submarine, and many more

ANTIC GR. & SO. DEMO #1

1. Graphic
2. Draw
3. Rainbow
4. Tune Rite
5. Etch Sketch
6. Baby Pro Sound and more

ANTIC presents these programs in diskette form for the convenience of the ATARI community, in the belief that all of the programs offered are in the Public Domain and that no proprietary interests or rights to these programs are claimed by anyone. These diskettes are not copyprotected, nor does ANTIC claim rights to the programs themselves. The price of the diskettes is based on the cost of making them available.

To place orders call toll free: Outside California (800) 227-1617 Ext. 133; Inside California (800) 772-3545 Ext. 133

Best of ANTIC
The ATARI Resource Anthology, Volume I

ANTIC Magazine covers ATARI* computers, software, peripherals and game machines in depth every month, Now we offer you the "Best of ANTIC Volume I," a valuable collection of the most popular programs and feature articles from our first year of publishing.

You'll get useful **utilities,** step-by-step **tutorials** and exciting **games** for your ATARI computer, plus a very special bonus of six **new ATARI arcade games** created especially for ANTIC, The ATARI Resource. If you own ATARI, you need ANTIC!

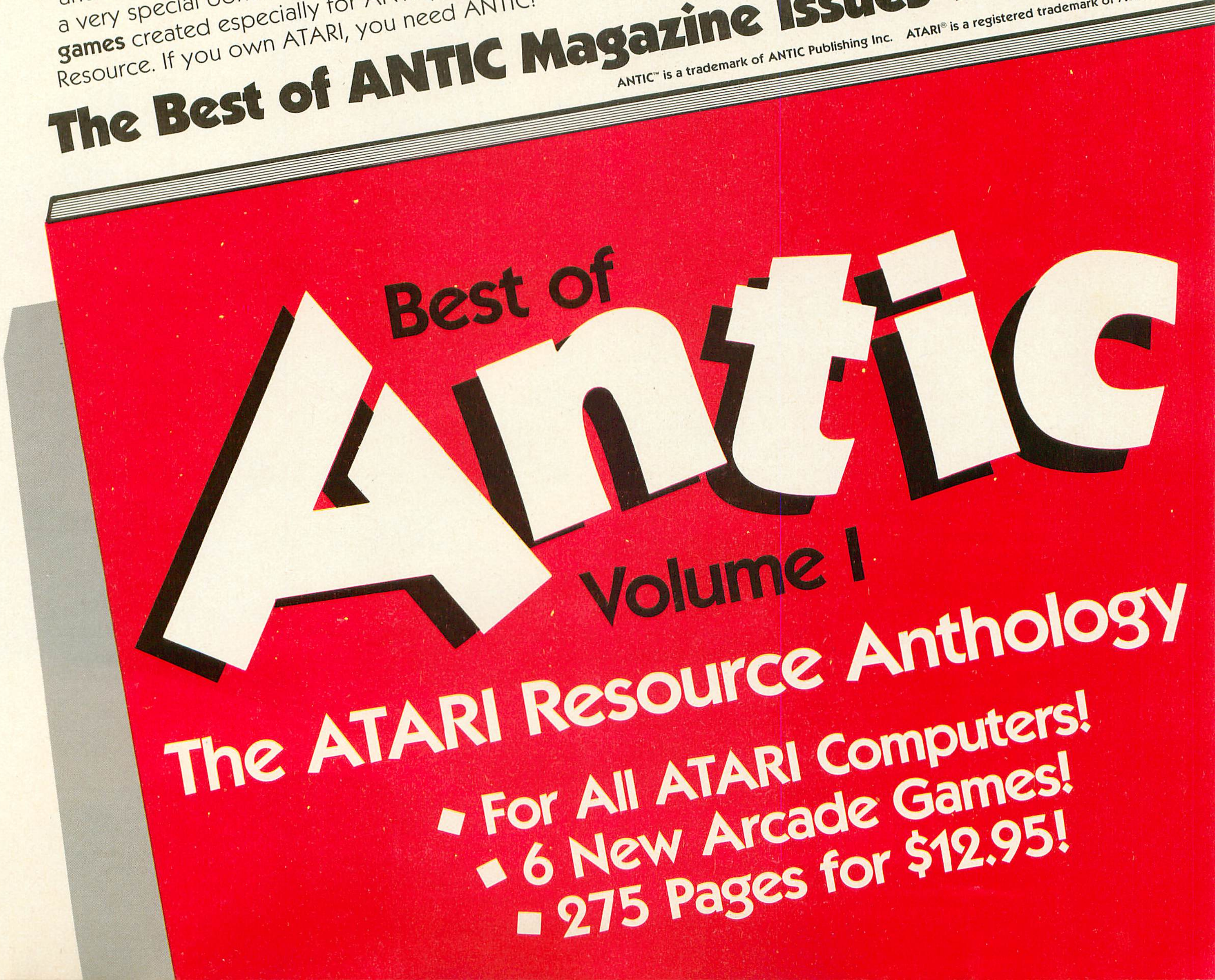
CALL TOLL-FREE to order ($12.95 + $1.50 postage & handling):
800-772-3545 x133 in California
800-227-1617 x 133 everywhere else

WRITE for "The ANTIC Anthology" ($12.95 + $1.50 postage & handling): ANTIC Publishing, 600 18th St., San Francisco, CA 94107. Write for a sample copy of ANTIC Magazine ($3.00).

ASK for "The ANTIC Anthology" at your favorite computer store or newsstand. (Available November 15th.)

The Best of ANTIC Magazine Issues 1 thru 6!

ANTIC™ is a trademark of ANTIC Publishing Inc. ATARI® is a registered trademark of Atari, Inc.

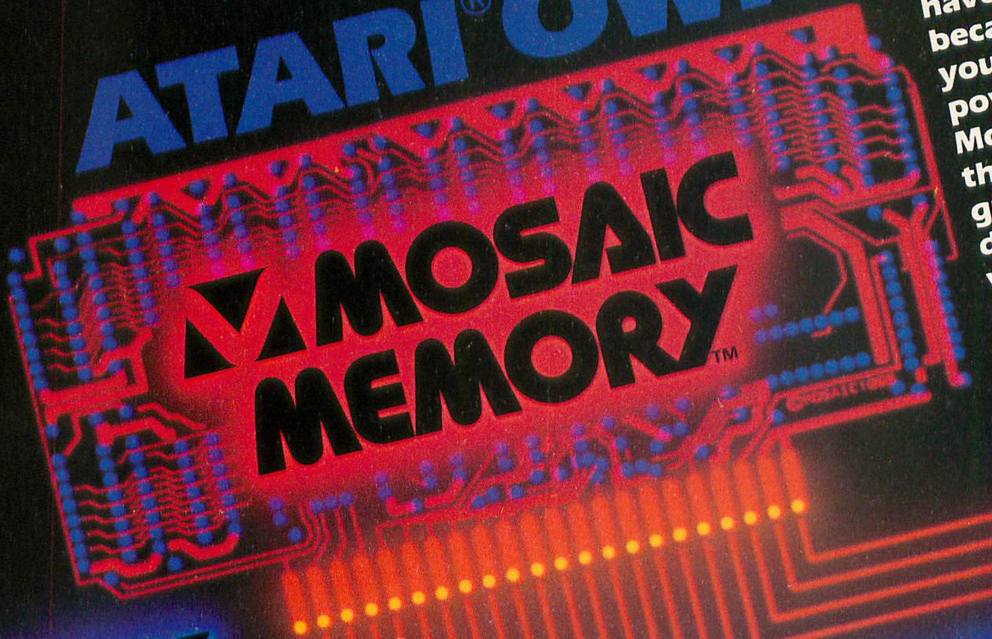



MEET YOUR CHALLENGE
MINER 2049ER
BOUNTY BOB
In Miner 2049er,™ you helped the legendary mounty, Bounty Bob,™ track the villainous Yukon Yohan™ through an abandoned uranium mine — all ten levels of it — grabbing buried treasure and avoiding deadly radioactive mutants along the way.
Well, that was only the beginning!
Yukon Yohan has escaped to the city and Bounty Bob is after him! Only this time, Bob's run out of bucks, so he's taken a job as a fireman to fund the chase. And guess which villain has torched a skyscraper to trap Bounty Bob?
You guessed it — Yukon Yohan!
Scraper Caper™ has all the action, adventure and excitement that can be packed into a ROM cartridge. And it features a mind boggling number of rounds, difficulty adjustment, high score table, demo mode and spectacular sound and graphic effects.
Miner 2049er is a gamer's gold mine, but you've got to beat Scraper Caper to get to the top! Scraper Caper is available from your local dealer for the ATARI® 5200 Supersystem™ and all ATARI Home Computers.
Suggested Retail $49.95
BIG FIVE
SOFTWARE
14640 Keswick Ave., Van Nuys, CA 91405 (213) 782-6861
"Miner 2049er", "Scraper Caper", "Bounty Bob" and "Yukon Yohan" are trademarks of Big Five Software. "ATARI" and "ATARI


HOTTEST
YET IN...
SCRAPER CAPER
Programmed
by Bill Hogue
2049

ATARI® OWNERS

have made Mosaic™ #1 because MOSAIC MEMORY gives you the best ways to boost the power of your Atari® computer. Mosaic boosted RAM means that the most advanced programs, games and peripherals designed for the Atari® computer will be available for you. With MOSAIC MEMORY you'll have every advantage the Atari® computer offers you.



32K RAM

FOR ATARI 400/800

This is the memory board that sets the standard for others. Its compatibility and reliability are legend. Interboard communication with 800.

48K RAM KIT

FOR ATARI 400

This RAM KIT converts your own Atari® 16K RAM board to a full 48K RAM. Only 5 wires to solder. Complete picture guided instructions.

64K RAM SELECT™

FOR ATARI 400/800

This is the most advanced memory board for the Atari® Computer. Awarded as "one of the most innovative computer products of 1983" at Chicago C.E.S. The SELECT™ gives you 52K continuous RAM and at least three banks of 4K RAM. 800 owners with two 16K boards have 96K RAM and can use up to three SELECTS for a 192K RAM total. No other board offers you the computing possibilities that the SELECT™ does.

THE MOSAIC ADAPTER™

FOR ATARI 800 WITH THREE 16K BOARDS

800 owners can now open slot three and maintain 48K RAM. The adapter accepts the chips off of two 16K RAM boards to become a single 32K board. Used with the SELECT™ you'll have 112K RAM!

THE MOSAIC EXPANDER™

FOR ATARI 400/800

This converts to a 32K RAM board with the chips from one Atari® 16K RAM board. 400 owners will have 32K RAM and 800 owners with two 16K boards will have 48K RAM.

XL OWNERS — Mosaic Memory available soon. Look forward to Mosaic Memory advancing Atari® XL computers into new worlds.

CABLE CONNECTOR PACKAGE #1

FOR ATARI® 400/800. This is the cable connector needed when you buy your first 64K SELECT™. It includes a free software program, SUPER DRIVE, a high speed disk simulator specially written to take advantage of the SELECT™ features, a $29.95 value.

CABLE CONNECTOR PACKAGE #2

FOR ATARI® 800. This cable is required by 800 owners who add additional SELECTS to their Atari®. This will enable the 800 owner to have up to 3 SELECT BOARDS installed for 192K RAM total.

For your nearest Mosaic™ dealer, call 1-800-2-ADD-RAM (1-800-223-3726)
In Oregon 653-7885

MOSAIC™ ELECTRONICS, INC.
P.O. Box 708 Oregon City, Oregon 97045

ATARI® is a registered trademark of Atari, Inc.
Mosaic is not affiliated with Atari.

ODD MAN OUT

Writing programs for preschoolers

by JOHN and MARY HARRISON

One of the major functions a computer can perform in the home is to aid in the children's education. In two previous articles, we examined the expanding role of the computer in formal education. Now it is time to focus on the home, a child's first school and the location of that marvelous machine we purchased to help our children, the ATARI home computer.

Although the computer can be readily applied to most subjects and all age groups, we will begin our discussion of educational software development at the preschool level. This is a challenging area because the audience has a short attention span and very few "academic" skills. We must use every means to retain the child's attention and promote a positive learning experience.

A CHOICE OF TOPIC

When writing educational software, the topic chosen must lend itself to use with the computer. There is no reason to develop educational software if the topic can be better covered in a traditional manner. The ATARI computers present a useful medium for the development of many skills. They are capable of presenting a variety of problems, randomly varying the exercises and consistently providing a reward based on achievement. The computer is a tireless and even-tempered companion, willing to endlessly repeat a series of drills or stop at any point the child desires.

One of the first skills a child must develop is visual discrimination, the ability to distinguish between different shapes. This sharpens a child's powers of observation, concentration, and attention to detail. Visual discrimination is also an important reading and number readiness skill. A child must be able to recognize the difference between the letters "E" and "F" or "m" and "n" before these symbols can be assembled into words. Similarly, the child must learn to distinguish between various groupings (sets) of objects and between symbols such as 6 and 9, 12 and 21. Educators think these abilities are so important that questions testing them often appear on I.Q. and achievement tests. Therefore, our program, **Odd Man Out** is designed to develop visual discrimination skills in preschool children.

STATEMENT OF OBJECTIVES

After choosing the topic, precise goals must be determined, a method of presentation selected, and a format developed. Proper preparation is important. Time spent defining and refining the program's objectives reduces the number of annoying problems that appear as the project begins to take form. Many people find that an outline is a useful method of organizing their thoughts.

The objective of this program is to teach a preschool child to select the "different" shape from a set of four. This objective can best be met through a drill and practice program.

Various levels of difficulty within the program, ranging from concrete pictures of familiar objects to abstract symbols, help the child to develop visual discrimination. The shapes are arranged horizontally to familiarize the child with standardized test formats.

The child must practice to become proficient at this skill. However, drill tends to be dull and boring. Through the use of sound and color graphics, the material can be presented in a manner that maintains the child's attention while effectively drilling the concept.

DETAILS, DETAILS

Now that we have a general idea of the program's goals, let's get specific. The first thing to decide is how many levels of difficulty it should include and what they should contain. This program allows the child to progress through seven levels of difficulty:

Level 1 — everyday concrete objects: star, tree, house, arrow, heart, boat, and rocket.

Level 2 — simple geometric shapes: diamond, square, triangle, ellipse, hexagon, rectangle, and cross.

Level 3 — reflections and rotations of the letter "E" and the shape "[".

Level 4 — capital letters of the alphabet.

Level 5 — lower case letters of the alphabet.

Level 6 — digits 0–9.

Level 7 — sequences of three digits.

Different levels are indicated by different background colors. Four randomly selected symbols are displayed in the middle of the screen. Three symbols are identical; the position of the odd (fourth) symbol is randomly selected. A small box appears under each symbol. Using

continued on next page

John and Mary Harrison are parents, teachers and ATARI hobbyists. Mary teaches math and computer science at the high school level. John holds an M.S. in computer science and develops educational software. They will be coordinating the Education Department for ANTIC.

the joystick, the child positions a little animal beneath the symbols and indicates a choice by pushing the trigger. If the choice is correct, a happy face appears and a pleasant sound is heard. An incorrect choice results in a sad face and a crying sound. A new selection of symbols does not appear until the correct choice has been made.

A game consists of 10 selections. The score is kept and displayed at the end of each game. If the child answers at least seven problems correctly on the first try, a graphic reward appears on the screen. After the game, the original menu is displayed so that another round can be played at any level the child chooses.

BELLS AND WHISTLES

Children tend to push buttons, particularly the [BREAK] and [SYSTEM RESET] keys on ATARI computers. Unfortunately, there is no way to disable the [SYSTEM RESET] key from BASIC. However, our program does disable the [BREAK] key. All other keys are ignored by the program.

Young children often have difficulty manipulating the joystick and may push the trigger without realizing it. To minimize this problem, our program slows and modifies the joystick response. It does not recognize the trigger unless the animal is actually beneath one of the four symbols.

Most children, even those who do not yet read, can recognize their names. Our program asks for the child's name and uses it in the final graphic reward. For the parent, a simple record keeping system keeps track of the level attempted and the score obtained each time the child plays the game. This record keeping option is only available on the game's disk version.

NEXT MONTH

Next month we will provide the complete program for Odd Man Out. The end result will be a useful piece of educational software aimed at the preschool age group, but the article also will identify and briefly explore how various graphics techniques are useful in such programs. Space prohibits us from describing all the details of the procedures. However, a rudimentary knowledge of BASIC, the desire to keep plugging away at the program, and a good ATARI graphics reference book should be enough to help you master the techniques we will cover.

None of the procedures are difficult, but they do go beyond the cursory graphics explanations found in the ATARI BASIC manual. Your local Atari dealer should have several graphics books available and may recommend a particularly good reference guide to you. Next month we continue to explore Odd Man Out, a program designed to develop visual discrimination skills in preschool children.

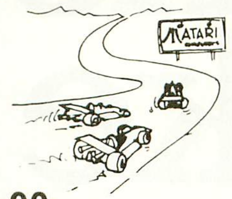
COMPUTER PALACE

Over 1000 Items For Your Atari!

ATARI®

We Know ATARI Computers... Call Us For The Latest Info: (503)683-5361

Pole Position



$44.90

The reviews are coming in on this one, and it sounds like another Winner From Atari!!! Super Scrolling Screen... Fast Speedway Action! 16K Cartridge

Super Mailer PLUS

From Royal Software

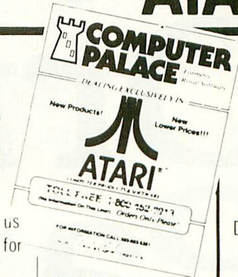


48K DISK **$49.95**

Dealer Inquiries Invited

- Store 500-2000 files per disk.
- Fast machine language sorts.
- Works on single or double density.
- Automatic delete of duplicates.
- Special coding feature.
- Official state abbreviations are built in.
- Re-label fields for unlimited uses.
- Merge files. • Create sub-files
- Search files on any field.

FREE Catalog



With any order, or send $1 (refundable with purchase). Send us your name & address for FREE QUARTERLY FLYERS with SPECIALS!

Over 1000 items for your Atari...

- Mosaic • Percom
- Broderbund • APX
- Roklan • Datasoft
- Synapse • A.I.
- On-Line • Atari
- Hayes • Epson
- Visicalc • More!

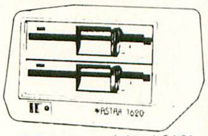
Use Your Credit Cards!

We honor VISA, American Express, & MasterCard.

24 & 48 Hour Shipping Is Available... CALL!

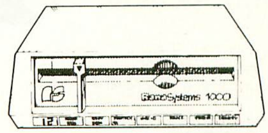
ASTRA 1620 Disk Drive

$488.00 Plus Freight



Double Density x 2 Drives = 4 Atari 810's

RANA 1000 Disk Drive



Double Density **$349.00** Plus Freight

Baseball

Super Sharp Colorful and Smooth Graphics, with 2-Player Option make this a Great Entertainer.

32K DISK or TAPE



From GAMESTAR **$28.90**

Welcome To Computer Palace...



When you are in Eugene, Oregon, please visit our well-stocked store and talk with our experienced, helpful Atari Experts. We have the largest selection of Atari Software & Hardware in the Northwest! **We specialize in Atari... So we know what works best!!!**



$54.00

The Monkey Wrench II

A cartridge for the right-hand Slot of your Atari 800!

This is a BASIC & Machine-language **Programmers Aid** for the 800. It plugs into the right slot, and works with Atari BASIC to add 16 new direct-mode commands(Incl. Auto line numbering, Delete lines, Renumber BASIC, Hex-Dec conv., Find string, Move lines, Exchange string, Disk directory from BASIC, Mem. test, More.). Also includes a monitor with 15 commands to interact with the 6502. This has been proven to be a very helpful tool when writing your own programs!

ALL-TIME FAVORITES

Star Raiders(C)	38.20
Eastern Front (D,T)	27.90
Pacman (C)	39.50
Temple of Apshi (D,T)	35.10
Zork I, II, or III (D) each	35.10
Centipede (C)	39.50
Missle Command (C)	29.70
Shamus (D,T)	31.50
Ghost Hunter (D)	34.95
Ghost Hunter (T)	29.95

TOP-TEN GAMES

Zaxxon (D,T)	35.10
Donkey Kong (C)	44.90
Choplifter (C)	39.50
Astro Chase (D,T)	26.90
Miner 2049er (C)	44.90
Football (D,T)	29.60
Pharaoh's Curse (D,T)	31.50
Dig Dug (C)	39.50
Way Out (D)	35.10
Ultima II (D)	52.50

SUPER SPECIALS... Up To 70% Off!

	Retail	Special	
Dog Daze(D,T)		9.95	
Pacific Coast Hwy(D)	29.95	15.95	
Protector(D,T)	34.95	19.95	
KStar Patrol(C)	39.95	19.95	
KRazy Kritters(C)	39.95	19.95	Value!
Number Blast(D,T)		9.95	
Bug Off	29.95	14.95	
Baseball(C)	49.95	29.95	
Picnic Paranoia(D,T)	34.95	19.95	
Dr.Goodcodes Cavern(D)	29.95	9.95	Wow!
Match Racer(D)	29.95	9.95	Look!
Nautilus(D)	34.95	19.95	
Chicken(D,T)	34.95	19.95	
Slime(D,T)	34.95	19.95	
Rear Guard(D)	29.95	9.95	
Tutti-Frutti(D)	29.95	9.95	Wow!
Rescue at Riguel(D)	29.95	12.95	

	Retail	Special	
Ricochet(D)	29.95	9.95	Deal!
Platter Mania(C)	39.95	17.95	A Steal!
Alien Swarm(D)	29.95	15.95	
Survival of the Fittest(C)		17.95	Wow!
Atari Mailing List(T)	24.95	9.95	
6502 Disassembler(T)		9.95	Look!
Apple Panic(D,T)	29.95	9.95	Low!
Stellar Shuttle(D,T)	29.95	9.95	
Clown's & Balloon's(T)	29.95	12.95	
Megalegs(T)	29.95	9.95	Look!
Magic Mail(D)	59.95	29.00	
Gorf(D)	40.00	19.95	Super!
K-Dos(D)	59.95	19.95	A Steal!
Alien Swarm(D)	29.95	12.95	
Snake Byte(D)	29.95	12.95	
Turmoil(C)	34.95	14.95	
Shattered Alliance(D)	39.95	14.95	

LIMITED QUANTITIES—WHILE SUPPLIES LAST!

HARDWARE

Astra Disk Drive	488.00
Micromainframe Disk Drive	499.00
Atari 1020 Printer	279.00
Atari 1010 Recorder	86.00
Atari 1025 Disk Drive	399.00
Panasonic Monitor (Grn Scrn, w/sound)	199.00
Dust Covers (400/800/410/810) each	8.95
Prostick II Joystick	23.50

SOFTWARE

Archon (D,T)	35.10
Pinball Construction (D)	35.10
Microsoft Basic II (C)	79.10
Diskey Utility (D)	44.90
Pinhead (D,T)	26.90
Murder on the Zinderneuf (D)	35.10
Blue Max (D,T)	31.50
Odessa Chess (D)	59.50
Frogger (T)	23.95
Pharoah's Pyramid (D)	31.50
Rally Speedway (C)	44.90

COMPUTER PALACE

OPEN Monday - Saturday, 9 to 6

2160 W. 11th Avenue Eugene, Oregon 97402

MasterCard VISA AMERICAN EXPRESS

USE YOUR CREDIT CARD & CALL

Toll Free 1-800-452-8013

(Orders Only, Please)

For Information Call (503) 683-5361

Shipping Note: UPS & Parcel Post-$2.00—UPS Air-$3.90
Shipping on hardware & paper supplis extra—Call for $.
24 & 48 hour shipping available... Call (503)683-5361

We specialize in *ATARI Compatible Products*
So we know what works best!!!
Call for the latest info... (503)683-5361

Looks like a
Drives like a
Parks like a



Ferrari.
Rolls.
Beetle.

Introducing the all-new 1984 Indus GT™ disk drive. The most advanced, most complete, most handsome disk drive in the world.

A flick of its "Power" switch can turn an Atari into a Ferrari.

Or an Apple into a Red Hot Apple.

Ask your favorite computer dealer to unveil the remarkable Indus GT for you. Test drive it. Then, get ready to drive home a world-class driving machine.

Looks Like a Ferrari.

The Indus GT is incredibly sleek. Only 2.65" high! Its smoked-glass dust-cover front-loading front-end width is a perfectly proportioned 6.27." Eye-catching. Distinctively European-Gran styled.

Touch its LED-lit CommandPost™ function controls. Lay a finger on its AccuTouch™ buttons. Feel its elegant, fluid form.

Admire its smooth, sculptured, masculine lines. Wonder at its ingenius slimline engineering.

Marvel at how responsive it makes *every* Atari or Apple home computer.

Drives Like a Rolls.

Nestled into its soundproofed 10.4" length chassis is the quietest and most powerful disk drive power system money can buy. At top speed (which it can handle all day long), it's virtually unhearable. Whisper quiet.

Flat out, the GT will drive your Atari track-to-track 0-39 in *less than one second!* Increasing data transfer an incredible 400%.

Built-in, low-friction GT CruiseControl metal band head-positioning assures Apple and Atari owners of trouble-free performance. So you can finish every project you enter.

And quietly tucked into every 1984 Indus GT disk drive is the exclusive GT DrivingSystem™ of software programs (included as standard equipment):

The GT DrivingSystem allows you to shift smoothly into world-class word processing with the GT *Estate WordProcessor.*™ And your dealer will describe the two additional new GT Driving System programs that allow you to advance your driving skills. Instantly. Smoothly. Easily.

The Indus GT and GT DrivingSystem are covered with the GT PortaCase.™ Which doubles as a 20-disk storage file when you're at home. Or as a portable case to flaunt your good taste and judgement when you travel. Safely. Smartly.

Parks Like a Beetle.

And it's sticker-priced like a Beetle, too. $449 for Atari. $329 for Apple.

The all-new, 1984 Indus GT.

Its small size makes it easy to park. And its low price makes it easy to buy.

So see and test drive the GT at your nearest computer dealer today.

The drive will be well worth it.

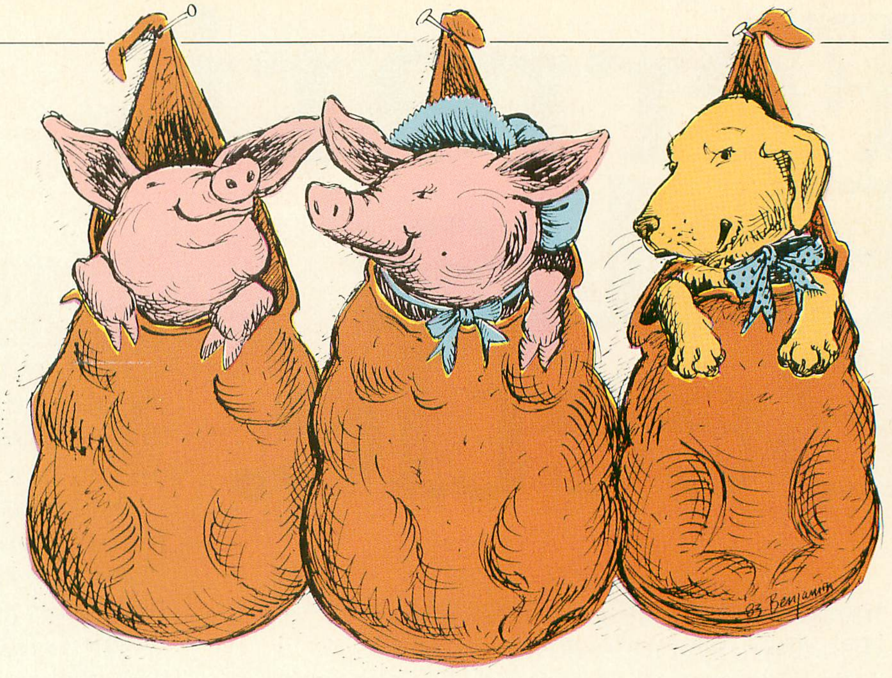


INDUS GT™

The all-new 1984 Indus GT Disk Drive.

The cover comes off at your computer dealer's showroom.

PIGS IN POKES



by MARIAN LORENZ and ALAN MOOSE

The software market has exploded with educational programs. Unfortunately, buying this software can be likened to "buying a pig in a poke." The chance of buying an unsuitable program is needlessly high, not because good software doesn't exist, but because most packages are sealed, preventing you from even reading the documentation.

Dealers usually carry only the most popular software, and those we visit rarely demonstrate more than games. Thus, many educational software purchases must be made through catalogs, relying on catalog descriptions or reviewer's opinions. Software reviews depend on the skill and background of the reviewer, which may not be strong in educational experience.

Since educational software is usually expensive, how then can a teacher or parent find carefully designed, well written programs? We will present some background and a checklist to assist you in evaluating educational software.

Instructional software falls into five main categories. These are: Drill/Practice, Tutorials, Simulations/Problem Solving, Games, and Management.

DRILL/PRACTICE: This type of program supplements previous instruction through reinforcement and practice.

For many of us, drill has negative connotations. Yet, drill and practice are an important part of the learning process. These programs can help with math, spelling, history, geography, and other subjects that require memorization, and can be good remedial tools. Using a computer can be a private activity and can reduce the self-consciousness many pupils with learning problems feel when they have to perform in a group situation.

TUTORIALS: These programs are instruction units that teach rules and concepts. They may be used to introduce new concepts or to re-teach work previously presented. Computers can provide immediate feedback, and students learn faster the sooner they know whether or not their answers are correct. Computers are not judgmental, they don't get tired, and a student's attention can be maintained longer at a computer. Also, the student has more control over the learning process than occurs in a group lesson.

SIMULATIONS/PROBLEM SOLVING: A simulation is a model of a real-life situation recreated by the computer, a situation that may be too expensive, complex, dangerous, or remote for classroom use. These programs allow the student to make use of known skills and concepts to develop new problem solving strategies. They should teach students to make decisions, think logically, and understand conceptual relationships.

GAMES: These are programs that allow students to apply skills and concepts in a game environment. They make provisions for learning rules, developing, and revising strategies. Games can feature competition with the computer, with oneself, or peers. Games can be cooperative efforts. Team games in which students cooperate to meet a common goal foster cooperation and positive interaction.

MANAGEMENT: Programs of this type are tools for the teacher. They can be used to schedule, test, keep records, and analyze student progress.

The first step in evaluating (or writing) instructional software is to define your need. Be as specific as possible about your goals and instructional objectives. This will help you determine which type of programs you want. Additionally, it will provide a reference against which to judge programs. An effective educational program combines educational and technical expertise. Therefore, you will want to consider the content and documentation, educational suitability, and technical aspects.

An important first area to evaluate is what the user sees — the screen displays. Four general principles can be used to judge the effectiveness of screen designs.

(1) Displays should be easy to understand, and they should not be crowded.

Allan Moose is an associate professor (math/physics) at Southampton College, New York. Marian Lorenz is a special education teacher for handicapped children.

For most students, six lines of double-spaced text is a reasonable maximum. Young learners can benefit from enlarged or colored text. Text printed in capital letters is not as easy to read as conventional capitals and lower case letters.

(2) Important information, new vocabulary, key words, and instructions should be highlighted, perhaps by using inverse video. Flashing words, letters, or phrases can be distracting, and are more appropriate for prompts.

(3) Text for students to read must follow established rules of punctuation, grammar, usage, and capitalization. Spelling errors in educational text are inexcusable.

(4) Graphics, sound, and color should be integrated with the program. They should convey information, draw attention to important facts, or reinforce learning. Too much sound can be wearing on the nerves and disturb a classroom. We believe that sound should not be used to indicate mistakes because it announces the student's errors.

After evaluating the screen displays, assess the educational integrity and usefulness of the program. Read the documentation and run the program. Two facets deserve special mention here. First, does the program accommodate student differences through branching and timing? Unless speed of response is a factor, the user should control the length of time the display remains on the screen. Branching is a way to structure a program so that a slow learner is not frustrated by inability to proceed, while still challenging the more able student. If the student responds correctly, the program can go to a more difficult level. If the student does not respond correctly, the program can return to an easier level or reteach the item.

The second facet is harder to achieve and may be comparatively rare. This is provision for teacher or parent to modify the program. For example, can the on-screen instructions be edited? Can the word lists, problems and/or informational data be amended? We suspect that this feature will go a long way toward the ultimate acceptance of computers by teachers in their daily work.

Finally, poor documentation can ruin an otherwise excellent piece of work. Documentation must include commentary on both technical and educational aspects. Technical documentation must give explicit instructions on how to use all parts of a program. (We own a well-known educational program, part of which we've never been able to use because the instructions are so poorly written). Equally important, the documentation must determine the knowledge the pupil is assumed to have. The goals and objectives of the courseware should be spelled out and the concepts identified.

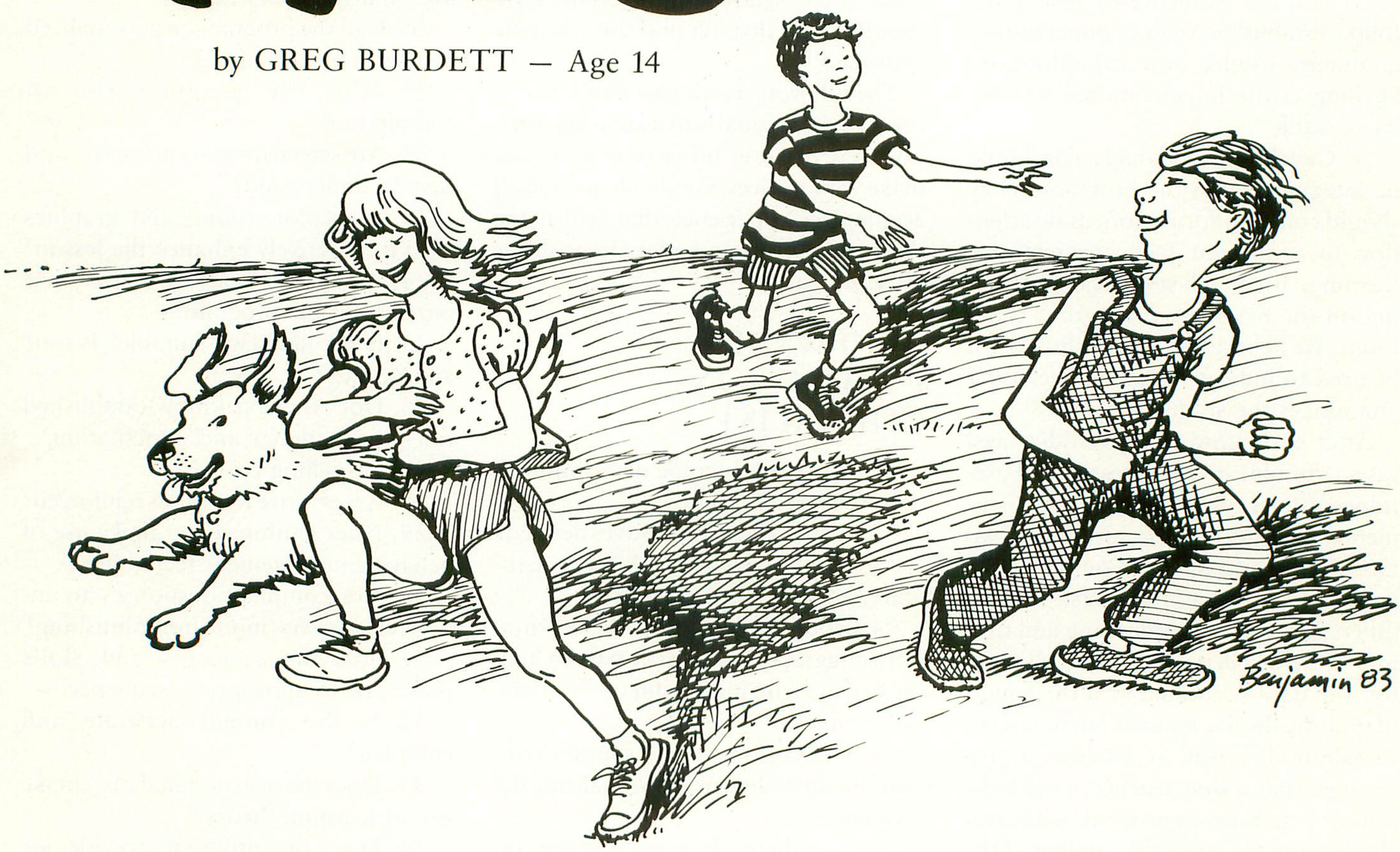
The following is our checklist for evaluating educational software programs. You may discover other criteria as you make your choices. Gradually we will all accumulate experience that will make these choices better, and we hope this is a useful start.

SOFTWARE EVALUATION CHECKLIST

1. Is the user's guide description of the program adequate?
2. Are goals and objectives defined?
3. Are prerequisite skills, vocabulary, and concepts given?
4. Does the guide provide information, suggestions and materials to help the teacher gain maximum use from the program?
5. Does the guide give simple directions for amending or individualizing the program?
6. Are there clear instructions on how to run the program?
7. Does guide indicate amount of RAM required to run program?
8. Does guide indicate the peripherals needed, if any?
9. Can cassette programs be transferred to disks?
10. Are back-ups available, if not, can they be made?
11. Are there established and understandable procedures for restoring a crashed program?
12. Is the target population defined?
13. Is the program appropriate for the target population?
14. Is the program compatible with the curriculum?
15. Is the content consistent with the given goals and objectives?
16. Does the program provide understandable directions for the user, avoiding computer jargon?
17. Can user return program to instructions if needed?
18. Can user operate the program independently or with relatively little need for assistance?
19. Is there interaction between the user and the computer?
20. Can the program be personalized by user input of name?
21. Will the program run to completion?
22. Are screen displays attractive and easy to understand?
23. Are color, sound and graphics used to effectively enhance the lesson?
24. Are there distracting or irrelevant portions in the program?
25. Is the language suitable? Is tone appropriate?
26. Does the text follow established rules for grammar and punctuation?
27. Is spelling correct?
28. Are positive responses reinforced?
29. Does reinforcement make use of behavior management techniques?
30. Are computer responses to incorrect answers/input non-punishing?
31. Are the concepts and skills presented in appropriate sequence?
32. Is the content accurate and complete?
33. Does the instructional plan make use of learning theory?
34. Does the program provide for individual differences?
35. Are provisions made for determining if user has mastered the material presented?
36. Does program save student's score, response pattern, or otherwise track progress?
37. Is program bulletproof to accidental or deliberate tampering?
38. Will company replace defective or damaged media?
39. Is program sensitive to cultural values and differences?
40. Does documentation ostensibly qualify authors, programmers for the work?

TAG

by GREG BURDETT — Age 14



TAG is a simple reaction game for two players. It begins with two different-colored dots on the screen — Player 1 is the dot on the left; Player 2 is the dot on the right. At the start of the game, Player 1 is "It."

His goal is to catch up with and meet the front end of the line created by Player 2's moving dot. The movement of the dots is controlled by two separate joysticks, which send the dots scurrying across the screen in multi-colored patterns. If Player 1 succeeds in catching his adversary, Player 2 becomes "It," and the cycle is repeated. The player who catches his opponent in the least amount of time is the winner.

Because the patterns created by the fast-moving dots become distracting after a while, the program automatically clears the screen of their crisscrossing paths every sixty seconds; however, the two dots remain in place throughout this procedure.

TAG is written in BASIC, and is fun to play, although it is a very short game. Greg began programming his ATARI 800 after participating in a computer camp at Brigham Young University two years ago. He is also familiar with assembly language and Player/Missile graphics. Greg lives in Ogden, Utah.

Requires 16K RAM

```
0 REM ANTIC MAGAZINE
5 GOSUB 400
10 A=0:B=0
20 GRAPHICS 5:POKE 710,0:POKE 752,1:M=
0:S=0:POKE 77,0
30 X1=0:X2=79:Y1=20:Y2=20:GOTO 100
```

```
95 POKE 540,60:S=S+1:IF S=60 THEN M=M+1:S=0
100 ST=STICK(0):ST1=STICK(1)
110 IF ST=15 THEN X1=X1+0:Y1=Y1+0
115 IF ST=14 THEN X1=X1+0:Y1=Y1-1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
120 IF ST=11 THEN X1=X1-1:Y1=Y1+0:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
125 IF ST=13 THEN X1=X1+0:Y1=Y1+1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
130 IF ST=7 THEN X1=X1+1:Y1=Y1+0:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
135 IF ST=6 THEN X1=X1+1:Y1=Y1-1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
140 IF ST=10 THEN X1=X1-1:Y1=Y1-1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
145 IF ST=9 THEN X1=X1-1:Y1=Y1+1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
150 IF ST=5 THEN X1=X1+1:Y1=Y1+1:SOUND 0,120,10,8:FOR I=1 TO 10:NEXT I:SOUND 0,0,0,0
155 IF X1>79 THEN X1=0
160 IF X1<0 THEN X1=79
165 IF Y1>39 THEN Y1=0
170 IF Y1<0 THEN Y1=39
180 COLOR 1:PLOT X1,Y1:COLOR 2:PLOT X2,Y2
190 LOCATE X1,Y1,X
200 IF ST1=15 THEN X2=X2+0:Y2=Y2+0
205 IF ST1=14 THEN X2=X2+0:Y2=Y2-1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
210 IF ST1=11 THEN X2=X2-1:Y2=Y2+0:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
215 IF ST1=13 THEN X2=X2+0:Y2=Y2+1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
220 IF ST1=7 THEN X2=X2+1:Y2=Y2+0:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
225 IF ST1=6 THEN X2=X2+1:Y2=Y2-1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
230 IF ST1=10 THEN X2=X2-1:Y2=Y2-1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
235 IF ST1=9 THEN X2=X2-1:Y2=Y2+1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
240 IF ST1=5 THEN X2=X2+1:Y2=Y2+1:SOUND 1,150,10,8:FOR I=1 TO 10:NEXT I:SOUND 1,0,0,0
245 IF X2>79 THEN X2=0
250 IF X2<0 THEN X2=79
255 IF Y2>39 THEN Y2=0
260 IF Y2<0 THEN Y2=39
265 COLOR 2:PLOT X2,Y2
270 IF X=2 OR X=4 THEN A=A+2:B=A/2:GOSUB 300
275 IF PEEK(540)=0 THEN 95
280 ? "{CLEAR}";M;":";S;" "
285 GOTO 100
300 IF B=1 THEN ? "{CLEAR}PLAYER #2 IS NOW IT!!!!":? "PLAYER #1 DID IT IN ";M;":";S;" BEAT THAT #2!":GOSUB 600
310 IF B=2 THEN ? "{CLEAR}PLAYER #1 IS NOW IT!!!!":? "PLAYER #2 DID IT IN ";M;":";S;" BEAT THAT #1!":A=0:B=0:GOSUB 600
320 GOTO 20
400 GRAPHICS 2:POKE 710,0:? #6:? #6:"player #1 is the  dot on the left side of  the  screen"
410 ? #6:? #6:"   player #2 is the   dot on the right  side of the screen"
420 FOR I=1 TO 1000:NEXT I
430 GRAPHICS 2:POKE 710,0:? #6:? #6:? #6:? #6:"   player #1 is 'it'  first":FOR I=1 TO 500:NEXT I:RETURN
600 RESTORE 620
610 READ TONE,TYPE:IF TYPE=0 THEN RETURN
612 POKE 540,TYPE:SOUND 0,TONE,10,8:SOUND 1,TONE+2,10,8:SOUND 2,TONE-2,10,8:SOUND 3,TONE,10,8
615 IF PEEK(540)=0 THEN SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND 2,0,0,0:SOUND 3,0,0,0:GOTO 610
618 GOTO 615
620 DATA 162,8,162,24,162,8,162,24,182,8,196,24,162,8,121,24,108,8,96,24,96,8,96,24,108,8,121,32,121,24,128,8
625 DATA 144,24,144,8,144,24,128,8,121,24,128,8,121,24,144,8,162,24,144,8,162,24,196,8,162,32,162,8,162,8
630 DATA 162,8,162,24,162,8,162,24,182,8,192,24,162,8,121,24,108,8,96,24,96,8,96,24,108,8,121,32,121,32,108,32
635 DATA 108,32,121,32,128,32,121,128,0,0
10000 GOTO 10000
```

TYPO TABLE

Variable checksum = 189271

Line num range			Code	Length
0	-	120	EI	631
125	-	140	AX	540
145	-	205	ZI	602
210	-	225	NQ	540
230	-	260	ZG	513
265	-	400	QY	506
410	-	615	WB	601
618	-	10000	IV	379

THE SECRET LIFE OF CASSETTES

by CARL EVANS

It's hard to believe, but a whole year has gone by since I started doing this column. In the upcoming year I will try to cover many of the topics you have requested and to pass along some of the routines I have developed to make cassette I/O easier. Thanks for your support over the past year. Now, let's get down to the business at hand — cassette file structures.

The following is a brief overview of cassette file structures as they apply to the ATARI 400/800/1200 home computers. It is intended to be a general introduction to the subject, so that the terms I'll be using in upcoming articles won't catch you by surprise.

Your programs and data files are stored on cassette tape in a structure (format) that is determined by a small portion of your computer's Operating System (OS). The section of the OS is called the "cassette handler." The basic structure used to store your program is called a "file." Most programs are stored in a single file; but, for various reasons, some programs are stored in two or more files. This latter type of program is referred to as a "multiple" or "multi-file" program.

A file is subdivided into "records." The first record of a file is called the "header" record. The file's last record is called an "end-of-file" (EOF) record. All of the records between them are called "data" records. Although one record follows another sequentially, records are not actually contiguous. They are separated by blank spaces called "inter-record gaps" (IRG's).

The fundamental building blocks of a file are the data records. All normal records, except EOF records, are data records. The 128 bytes of a data record usually contain a small segment of your program, but even a small program requires the use of many data records. Under normal conditions, the last record in a file is not a data record. This position is occupied by an EOF record.

The first data record in a file usually contains special instructions for the OS. Although this record is referred to as a "header," it differs from a data record primarily in that it is the first record in the file.

In machine language files, the significance of this record is found in the first six data bytes (see Figure 1). The first byte is not used by the computer, but the next five bytes tell the OS's "boot loader" subroutine everything it needs to know to load a machine language file. The second byte tells the OS how many records are in the file, including the header record. The third and fourth bytes specify the low and high memory addresses where the computer is to begin loading the file. The fifth and sixth bytes tell the computer the low and high memory addresses where initialization of the program should start (the entry point of the program).

BASIC files are handled by a different portion of the OS, and as a result the BASIC header record differs from the equivalent record for a machine language file. In fact, in a BASIC file, the header can be several records long. The specific length depends on a number of things.

IGNORED		1st BYTE
# OF RECORDS		
MEMORY ADDRESS	LO	
TO START LOAD	HI	
INIT	LO	
ADDRESS	HI	6th BYTE

Figure 1
Cassette Boot File Header

The first thing to consider is whether the file is tokenized. A file stored by the SAVE or CSAVE command *is* tokenized, and has a long, complicated header that consists of two blocks of information. The first block contains seven of the nine Page Zero pointers that BASIC uses to

---

Carl Evans is a widely published author in various technical and home computer magazines. He is also the author of a best selling book, ATARI BASIC BETTER AND FASTER.

maintain the token file in memory. The second block consists of the program's variable name table (VNT) and variable value tables (VVT's). The header, as defined here, uses as many records as necessary to hold these two blocks. The header for a non-tokenized file, such as one stored by the LIST command, is short and uncomplicated because these files are treated like keyboard input.

An EOF record differs from other records in two ways. First, it includes a special code in the third byte that tells the computer that "this is an EOF record." Second, all of its data bytes are set to zero. BASIC does not normally make use of the EOF record, because the BASIC header tells the computer how large the file is. If, for example, you try to CLOAD a file that is too large for the amount of RAM you have left, you will almost immediately get an error 19, which is a "LOAD program too long" error.

Every normal record consists of 132 eight-bit bytes (see Figure 2). The first two bytes are used by the computer for speed control. Byte three is a special flag used to identify the type of record. The next 128 bytes are the "data bytes" that contain your program or other special information. The record's last byte is a "checksum byte" that is used for read verification. (The noise you hear on your TV during a read or write operation is the sound of the data in a record being transferred.)

As I mentioned previously, the first two bytes of a record are used by your computer for speed control when it is loading a file. The computer measures the time required to read these two bytes and then makes a number of small adjustments to some of its OS variables. This process, called "baud rate synchronization," tells the computer when and how fast information will be coming from your tape recorder.

It is possible, however, to change the

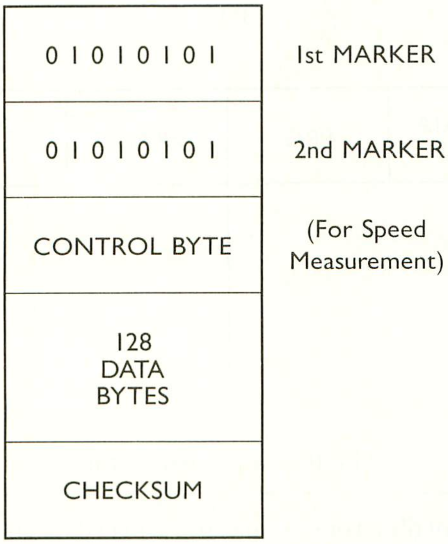


Figure 2
Cassette Data Record

algorithm that the OS uses to control the baud rate. I have found that I can get reliable cassette operations at baud rates as high as 820 with the 410 recorder. And if you use a cassette interface adapter that allows you to use other types of recorders, you can operate at baud rates as high as 1200 without serious degradation.

If you are interested in using higher baud rates, you can either read my article on the subject next year (complete with a program listing) or you can purchase a program from VERVAN called V-COS. (V-COS is a cassette operations utility written by Del Wong. The program is available from IJG, Inc. Their phone number is (714) 946-5805.)

The third byte of a record is a control code byte that usually has one of three values. A value of $FE (254) indicates that the record is an EOF record. A value of $FC (252) notes that all 128 bytes have been used. All data records, including the header, contain this particular control code except the last record in the file. The last data record can contain this code, but most of the time it does not, because it is unlikely that a program will be an exact multiple of 128 bytes in length. Usually the last data record will have a control code of $FA (250). This tells the computer that fewer than the full 128 bytes in the record actually contain data. It also notes the exact number of bytes in the record that do contain information.

The last byte in a record is the checksum byte. The computer uses the value of this byte to validate, or verify, that the preceding 128 data bytes were read properly. When your computer writes a record onto a tape, a checksum is calculated for the 128 bytes in that record. The computer adds the values of each byte in the record together. If the sum exceeds 255, it simply starts counting at zero again.

The one peculiarity of checksum computation in the ATARI is that it uses "end-around carry." This means that "one" is added to the sum every time the total reaches 255. (See Figure 3 for the actual equation used.) This checksum value is stored in the checksum byte of a record as it is being written.

When the computer reads a record from tape, it computes a new checksum for the data bytes in the record and compares the new value to the value that was previously stored in the checksum byte. If the two values match, the computer proceeds to read the next data record. If they do not agree, the computer stops the loading process and gives you an error 143.

The "inter-record gap" (IRG) between records is actually the sum of the two gaps (see Figure 4). Every record is preceded by a "pre-record write tone" (PRWT) and is followed by a "post-record gap" (PRG). When the records are linked into a file, the resulting IRG equals the sum of the PRWT and the PRG.

The basic difference between "continuous" files and "stop-start" files is the

continued on next page

$$\text{Checksum} = [\text{speed control byte } \#1] + [\text{speed control byte } \#2] + \sum_{N=1}^{N=128} [(\text{Data byte})_N + (\text{Carry flag})]$$

Figure 3
The Checksum Equation

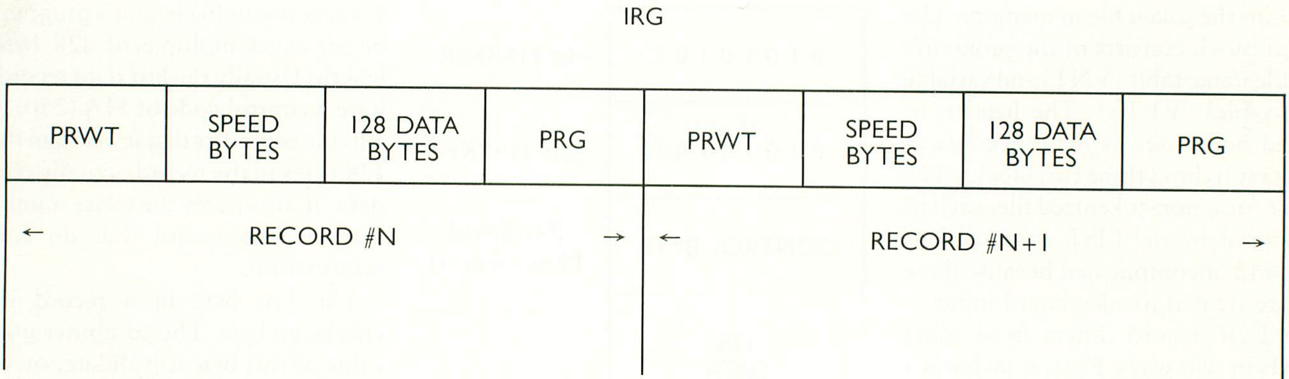


Figure 4
The IRG in a cassette file

length of this IRG. Essentially, a continuous file has a very short IRG, while a start-stop file has a longer IRG. The longer gap used with stop-start files provides you with enough time to stop the cassette motor, restart it, and get motor speed up to normal before beginning the next record. These electro-mechanical operations require far more time than the short IRG's between records in a continuous file. In fact, under certain conditions the computer cannot accept data fast enough to accommodate continuous loading. This is why there are two kinds of files. For example, if you load data into a program using BASIC, instead of machine language, you will have problems with a continuous file.

The PRWT is not a fixed value any more than the baud rate is. It can be altered by using the appropriate program. This is of particular interest in the case of the 20-second PRWT that is inserted at the beginning of every cassette file. I have experimented with this leader tone, and have been able to shorten it to about 10 seconds with no noticeable degradation in performance. And the V-COS program I mentioned earlier features a built-in function that enables you to change this leader to any length you want.

That's all for this month. In the coming months, I will go back over each of these topics in greater detail. I will show you how the OS uses this information, where the proper control bytes are located in memory, and how you can control some of the more important parameters by using short machine language routines.

Tangle Angles

by CARL EVANS

I bought an 800 computer when the 410 recorder was included as part of the package. Since then I've had to send the 410 to be repaired several times. This was very inconvenient, so I started doing my own repairs.

Some of my friends were having similar problems, so I summarized my experiences in a report that covers belt slippage, Record/Play head alignment, cassette door replacement, cable connections, and other minor servicings. The report comes with five illustrations and a diagnostic chart. It also tells where to get parts and how much they cost. At this time, however, my report only covers the second version of the 410 (with the pause button). Would you consider publishing this report? I believe that your readers would benefit from it.

Walter Lee
Beltsville, MD

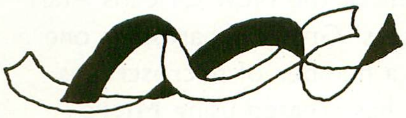
Yes, we would be very interested in publishing your repair manual in ANTIC. Many of us would benefit greatly from the information you have gathered. I will be contacting you directly regarding your article, but I am also answering you here in Tangle Angles so that our readers will know about you and can look forward to seeing your article in a future issue of ANTIC.

I wrote you about the progressively serious problems I was having loading my 410 recorder; I suggested that my recorder's problem might be due to motor instability and the differences between machines made in Japan and Hong Kong.

When I took my machine apart while preparing to follow the instructions you sent me, I noticed that almost all of the screws in the drive motor were loose. I tightened them and put the recorder back together, and now it works better than ever! I haven't had any further trouble loading or saving programs, and I can't help wondering how many $40 repair jobs have simply been the result of loose screws.

Kenneth Bishop
Santa Clara, CA

I never thought about checking the motor mounting screws. The fix you discovered was a valid one, since a loose motor would not drive the cassette properly and the already poor WOW of the recorder would become even worse. Thanks for the tip.



I need help in retrieving data from cassette tape in a variable format.

I've written a program for personal use called "Vehicle Cost Analysis and Records." When I'm through exercising data in the program, I need to save variable values for MM, GG, and DD (total miles, total gallons, and money spent to date on variable cost items).

I have no trouble saving data as follows:

```
1000 OPEN #1,8,0,"C:"
1010 FOR X=0 to 128
1020 PUT #1;32
1030 NEXT X
1040 PRINT #1
1050 PRINT #1;MM
1060 PRINT #1;GG
1070 PRINT #1;DD
1080 CLOSE #1
```

My problem seems to be in reading this data. I have used the following with partial success; sometimes it works, sometimes it doesn't:

```
2000 OPEN #1,4,0,"C:"
2010 FOR X=0 to 128
2020 INPUT #1,BLANK
2030 NEXT X
2040 INPUT #1; MM,GG,DD
2050 CLOSE #1
2060 PRINT MM,GG,DD
```

I have even resorted to saving data twice to avoid any tape leader problems and trapping routines, but I still don't have a reliable data saving and retrieval routine.

I have also had problems, due to my limited understanding of BASIC, developing a routine to change, delete or add data to an existing data record previously recorded on tape. Any help you can give will be most appreciated.

Ken Addy

Your problem is due to bugs in both your programs. Change your "WRITE DATA" routine to:

```
1000 TRAP 1080:OPEN #1,8,0,"C:"
1010 FOR X=0 TO 127
1020 PUT #;32
1030 NEXT X
1040 PRINT #1
1050 PRINT #1;MM
1060 PRINT #1;GG
1070 PRINT #1;DD
1080 CLOSE #1
```

The bug in this routine was the range used in the FOR-NEXT loop. Using "FOR X=0 TO 128" will cause 129 bytes to be written rather than the desired 128. I added the TRAP statement as a general safety feature.

The "INPUT DATA" routine had the same loop counter error as well as a more serious one. An "INPUT #1, BLANK" statement causes an entire 128 byte record to be read from the tape. Change the input routine to:

```
2000 TRAP 2050:OPEN #1,4,0,"C:"
2010 FOR X=0 TO 127
2020 GET #1,BLANK
2030 NEXT X
2040 INPUT #1;MM,GG,DD
2050 CLOSE #1
2060 PRINT MM,GG,DD
```

The two routines shown here will do what you asked for. By the way, it is not possible to edit a single record in a tape file. The only way to update a data file is to load the whole file into memory, modify or add to it, and then write the whole file back to tape. Any other method courts disaster.

microscreens









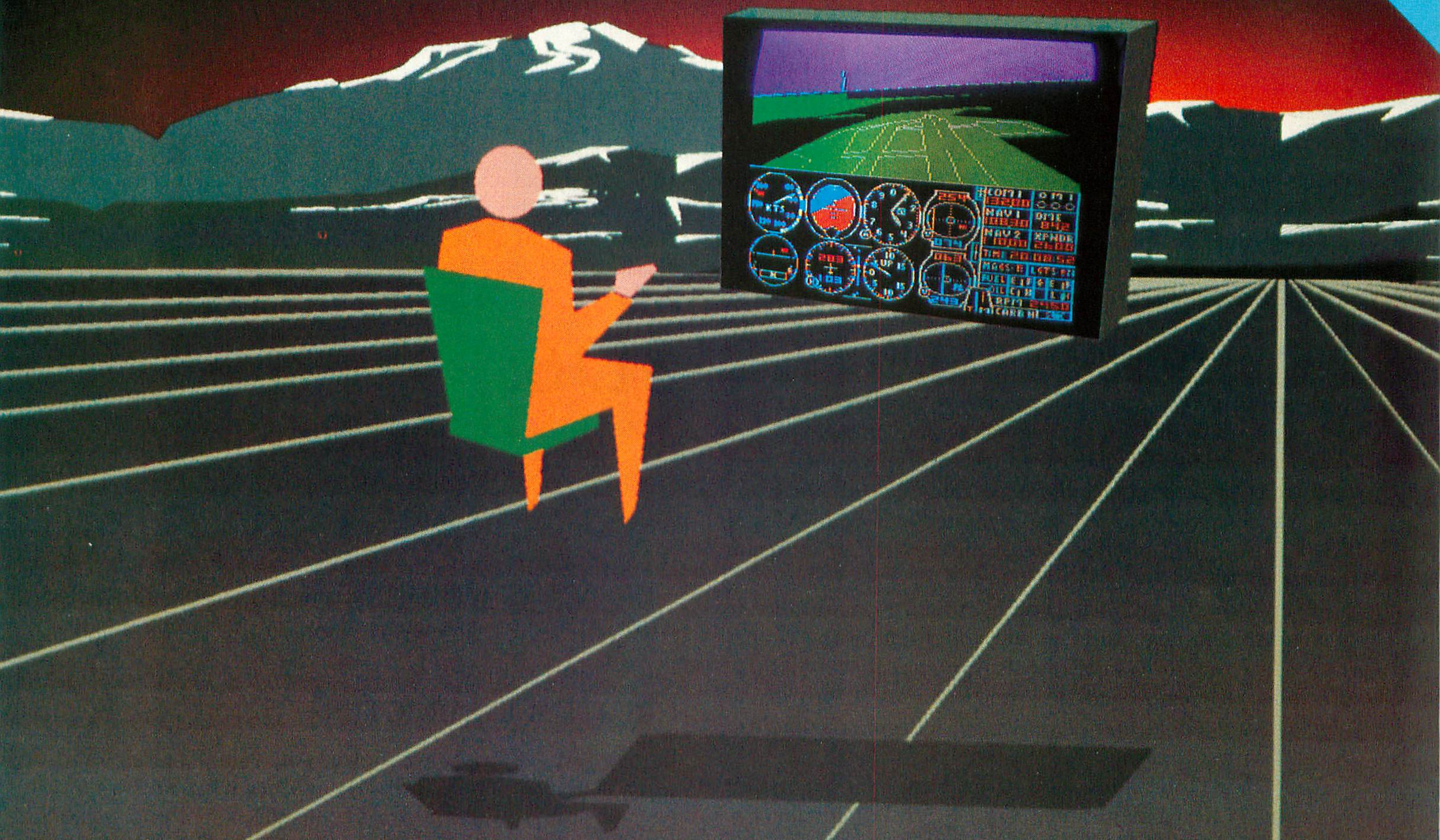
Night Flight was created by Michael Green of South San Francisco using **Keystroke Artist**. This striking representation of an airplane's control panel at night is one of several he has submitted. Michael, a baker by trade, has been drawing on his ATARI 800 for about five months. His second picture is *Early Spring*; the locale is strongly reminiscent of Lake Tahoe's Emerald Bay.

Paul Strauss' *Chariots of Fire* represents the logo and captures the spirit of the award-winning motion picture. An ATARI aficionado, Paul is president of the New Orleans Atari Users' Group. Chariots is one of a number of microscreens he has created using **Micro-painter** and an autoloader from BASIC that makes running pictures as simple as pressing the space bar.

Race by Nathan Hood of Oakland, Calif., falls into that category of microscreens that require no description. Who could mistake the subject of this submission? Nathan is a ninth grader at Bret Harte Junior High School, and was president of the school's computer club last year. He produced Race by projecting a slide onto his TV screen and tracing the image with **Micro-painter**.

Flight Simulator II

For Atari computers with 48K memory



Put yourself in the pilot's seat of a Piper 181 Cherokee Archer for an awe-inspiring flight over realistic scenery from New York to Los Angeles. High speed color-filled 3D graphics will give you a beautiful panoramic view as you practice takeoffs, landings, and aerobatics. Complete documentation will get you airborne quickly even if you've never flown before. When you think you're ready, you can play the World War I Ace aerial battle game. Flight Simulator II features include ■ animated color 3D graphics ■ day, dusk, and night flying modes ■ over 80 airports in four scenery areas: New York, Chicago, Los Angeles, Seattle, with additional scenery areas available ■ user-variable weather, from clear blue skies to grey cloudy conditions ■ complete flight instrumentation ■ VOR, ILS, ADF, and DME radio equipped ■ navigation facilities and course plotting ■ World War I Ace aerial battle game ■ complete information manual and flight handbook.

See your dealer . . .

or write or call for more information. For direct orders please add $1.50 for shipping and specify UPS or first class mail delivery. American Express, Diner's Club, MasterCard, and Visa accepted.

Order Line: 800/637-4983

subLOGIC
Corporation
713 Edgebrook Drive
Champaign IL 61820
(217) 359-8482 Telex: 206995

CASTING CHARACTERISTICS

More ways to mold your minions

by BOB ALBRECHT and
GEORGE FIREDRAKE

DragonSmoke poses problems for you to ponder, questions for you to answer, programs for you to write, and whatever other mischief we might cunningly contrive. As time goes on, and as issue follows issue, we will answer some of the problems we create. Better yet, you answer.

FANTASY ROLE PLAYING GAMES

Millions of people are playing fantasy role playing games. A role playing game is a game in which one or more players create and control characters (adventurers) who live their imaginary lives in a specially made game world. The game world is created, managed, and operated by a GameMaster (GM), also called a referee, adventure master, or dungeon master (DM).

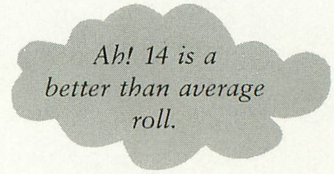
If you want to play, instead of just watch, you must create a character, an adventurer whom you guide in the GameMaster's world. In "GameMaster's Apprentice," we will show you how to create characters for *RuneQuest, Worlds of Wonder,* and *Adventurer's Handbook: A Beginners Guide to Role Playing Games.*

Your character begins with seven basic *characteristics:* Strength (STR), Constitution (CON), Size (SIZ), Intelligence (INT), Power (POW), Dexterity (DEX), and Charisma (CHA). These characteristics are similar to the characteristics in other game systems, such as *Dungeons & Dragons* or *Tunnels and Trolls.* The following table shows approximate equivalents.

Adventurer's Handbook, RuneQuest, or Worlds of Wonder	Dungeons & Dragons (D&D)	Tunnels & Trolls (T&T)
Strength (STR)	Strength (STR)	Strength (STR)
Constitution (CON)	Constitution (CON)	Constitution (CON)
Size (SIZ)	Done differently	Done differently
Intelligence (INT)	Intelligence (INT)	Intelligence (IQ)
Power (POW)	Wisdom (WIS)	Luck (LK)
Dexterity (DEX)	Dexterity (DEX)	Dexterity (DEX)
Charisma (CHA)	Charisma (CHA)	Charisma (CHR)

You crate a character by rolling three six-sided dice for *each* characteristic. If you have been reading "DragonSmoke," you know we use the abbreviation "3D6" to mean "three six-sided dice."

3D6:



Oh, you don't have 3D6. Nevermind . . . use your friendly ATARI to roll up a character and display the numbers on the screen.

CREATE A CHARACTER

In the May, 1983 issue we showed you a simple program to roll a character. There is always another way! So this time we will show you several ways to do the same thing: create a character. We begin with a program suggested by Keith Tacia. Thanks, Keith.

```
100 REM ** CREATE A CHARACTER
105 REM ** SUGGESTED BY KEITH TACIA
110 DIM TRAIT$(3)

200 REM ** GET READY
210 RESTORE
220 PRINT CHR$(125)

300 REM ** ROLE & DISPLAY CHARACTER
320 FOR = 1 TO 7
330 READ TRAIT$
340 GOSUB 910
350 PRINT TRAIT$,DICE
360 NEXT K
370 DATA STR,CON,SIZ,INT,POW,DEX,CHA
```

continued on page 94

Computer Outlet

We offer the largest selection of software and hardware for Apple, Atari, Commodore, IBM and Kaypro at 25 to 40% off retail.

1095 East Twain, LasVegas, NV 89109 • Mon.-Fri. 8AM to 6PM, Sat. 9AM to 5PM

600 XL $169
800 XL CALL

1010 Recorder	$ 75
1050 Disk Drive	$359
1027 Printer	CALL
1025 Printer	$459
830 Modem	$165
Touch Tablet	$ 67
Entertainer System	$ 64
482 Educator	$110
483 Programmer	$ 52
Communicator II	$209
Atari Accounting	$169
CX4104 Mailing List	$ 19
CXL4007 Music Composer	$ 42
Programming 2 & 3	ea. $ 22
Conversational Languages	ea. $ 45
CX4018 Pilot	$ 55
CXB126 Microsoft Basic II	$ 62
CXL4022 Pac-Man	$ 33
RX8043 Ms. Pac-Man	$ 39
CXL4020 Centipede	$ 33
CXL4006 Super Breakout	$ 26
CXL4008 Space Invaders	$ 26
CXL4009 Computer Chess	$ 26
CXL4011 Star Raiders	$ 30
CXL4012 Missile Command	$ 28
CXL4013 Asteroids	$ 28
The Bookkeeper	$102
Home Filing Manager	$ 38
Atari Speed Reading	$ 57
Family Finance	$ 38
Time Wise	$ 23
Galaxian	$ 33
Defender	$ 33
Paint	$ 33
Qix	$ 33
Dig Dug	$ 33
ET Phone Home	$ 34
Atari Writer	$ 75
Donkey Kong	$ 36
Donkey Kong Jr.	$ 38
Atari Logo	$ 79
Football	$ 36
Pole Position	$ 39
Mickey in the Great Outdoors/D	$ 34
My First Alphabet/D	$ 25
Peter Pan's Daring Escape	$ 34

Business & Utilities

Visicalc	$169
Computari's Financial Wizard	$ 45
Color Accountant	$ 65
Mail Merge	$ 20
Data Perfect	$ 95
Letter Perfect	$105
Bank Street Writer	$ 45
Text Wizard	$ 33
File Manager 800 +	$ 65
Datasm 652.0	$ 59
Paint Wizard	$ 34
K-Dos	$ 59
Lisp Interpreter	$ 79
Basic Compiler	$ 55
Datalink	$ 27
Atari World	$ 39
Color Print	$ 27
Graphics Generator	$ 17
Micropainter	$ 23
Graphics Master	$ 17
P.M.P. Property Management	$149

Educational

Pre-School

Sammy the Sea Serpent	(C) $ 13 (D) $ 19
Pre-School I.Q. Builder	(C) $ 13 (D) $ 24
My First Alphabet (D)	$ 26
Alien Counter/Face Flash (D, C)	$ 26
Humpty Dumpty/Jack & Jill (C)	$ 25
Facemaker (D)	$ 23
Juggles Rainbow (D, C)	$ 22
Juggles House	$ 22
Alphabet Zoo (CT)	$ 20

Music

Music Composer (CT)	$ 42
Jerry White Music Lessons (C)	$ 20
Magic Melody Box	$ 14

Social Studies and Geography

Globemaster (D)	$ 27
States and Capitals (C)	$ 12
European Countries and Capitals (C)	$ 12

Math

Monkey Up A Tree(D,C)	$19
Video Math Flash Cards(D,C)	$13
Algicalc(D,C)	$19
Compumath-Fractions	(C)$23(D)$29
Compumath-Decimals	(C)$23(D)$29
Golf Classic/Compubar (Angles)	(D,C)$26
Cash Register	(C)$13(D)$19
Big Math Attack	(C)$17(D)$22
Computation Concentration	(C) $13 (D) $15

Reading and Language Arts

Wordmaker (D, C)	$ 19
Spelling Genie (D, C)	$ 19

Compuread	(C) $ 17 (D) $ 23
Memory Builder/ Concentration	(C) $ 13 (D) $ 19
Let's Spell (C)	$ 13
Do-It-Yourself Spelling (C)	$ 16
S.A.T. College Board Prep (C)	$ 89
Vocabulary Builder I	(C) $ 13 (D) $ 19
Fishing for Homonyms (C)	$ 13
Hey Diddle Diddle (D)	$ 20
Snooper Troops 1 & 2 (D)	Ea. $ 30
Story Machine (D)	$ 23
Crossword Magic (D)	$ 34
Delta Drawing (CT)	$ 23

Programming Techniques

Pilot (Cons. of Educator)	(C) $ 59 (D) $ 99
Invitation to Prog. #2 (C)	$ 22
Invitation to Prog. #3 (C)	$ 22
Tricky Tutorials — Ed Software	
TT#1 Display Lists (C, D)	$ 17
TT#2 Horiz/Vert. Scrolling (C, D)	$ 17
TT#3 Page Flipping (C, D)	$ 17
TT#4 Basics of Animation (C, D)	$ 17
TT#5 Player Missile Graphics (C, D)	$ 24
TT#6 Sound & Music (C,D)	$ 24
TT#7 Disk Utilities (D)	$ 24
TT#8 Character Graphics	$ 19
TT#9 GTIA	$ 19
TT#10 Sound Effects	$ 19
Page 6	$ 20
The Next Step	$ 27

Stocking Stuffers

WICO "BOSS" Joystick	**$ 15.00**
WICO Redball Joystick	**$ 24.00**
Elephant Disks s/s	**$ 18.00**
Verbatim Disks s/d	**$ 24.00**
Disk Savers (Plastic Sleeves) Multi Colored 1 Doz.	**$ 4.50**
Disk Mailers	**$ 3.50**
Flip 'n File Diskette Holder w/Lock (holds 25)	**$ 18.50**
Flip 'n File Diskette Box (holds 50)	**$ 21.00**
Library Carrying Case (holds 10)	**$ 2.50**
Koala Touch Tablet	$ 69.00

Super Savers

Gorilla Banana Printer	**$ 209.00**
Percom Single Density Drive	**$ 389.00**
Percom Double Density Drive	**$ 515.00**
Amdek Color I Monitor	**$ 299.00**
Rana 1000 Drive	$299.00

Modems

Hayes Smartmodem 300 Baud	$209
Hayes Smarmodem 1200	$499
Signalman Modem II	$ 79

Monitors

Leading Edge Gorilla Hi-Res 12"	$ 85
Amdek Color I	$ 299
USI Amber	$ 149
NEC Green Screen	$ 169

Printers

Nec 8023A	$ 475
Epson FX80	$ 599
Epson FX100FT	$ 789
Okidata ML82A	$ 399
Okidata ML83A	$ 615
Okidata ML84 P	$1049
Okidata ML92 P	$ 469
Okidata ML93 P	$ 789
Citoh 8510 Prowriter	$ 365
Mannesmann Tally 160L	$ 629
Qume Sprint 11 +	$1429
Gemini 10X	$ 299
Gemini 15	$ 479

New Hit List

In Search of the Most Amazing Thing	$ 27
Witness	$ 34
Cosmic Balance II	$ 27
Temple of Apshai	$ 27
Raster Blaster	$ 20
Deadline	$ 34
Richochet	$ 15
Wiz & Princess	$ 22
Ali Baba and the Forty Thieves	$ 22
Canyon Climber	$ 20
Crush, Crumble & Chomp	$ 20
Zork I, II & III	Ea.$ 27
Frogger	$ 23
Choplifter	$ 23
Curse of Ra	$ 15
Ulysses and the Golden Fleece	$ 23
Tigers in the Snow	$ 27
David's Midnight Magic (D)	$ 23
Sky Blazer (D)	$ 22
Serpentine (D)	$ 22
Sea Fox (D)	$ 20
Sands of Egypt (D)	$ 27
Pool 400 (CT)	$ 27
Gorf	(D)$ 27 (CT)$ 30
Wizard of Wor	(D)$ 27 (CT)$ 30
Cyborg (D)	$ 23
Gold Rush (D)	$ 23
Bandits (D)	$ 23
Way Out (D)	$ 27
Fast Eddy (CT)	$ 24
World War (CT)	$ 24
The Cosmic Balance (D)	$ 27
Chess (D)	$ 45
Checker (D)	$ 34
Raptillian (D,C)	$ 23
Submarine Commander (CT)	$ 34
Jumbo Jet Pilot (CT)	$ 34
Soccer (CT)	$ 34
Starcross (D)	$ 27
Zaxxon (D,C)	$ 27
Miner 2049er (CT)	$ 34
Twerps (D)	$ 23
Flip Out (D)	$ 20
The Birth of the Phoenix	$ 16
Protector II	(D)$ 23 (CT)$ 29
Baseball (CT)	$ 34
Preppie II (D,C)	$ 23
Arcade Machine (D)	$ 39
Cap n' Cosmos (D)	$ 29
Spy's Demise (D)	$ 15
Repton (D)	$ 27
Critical Mass (D)	$ 27
Millionaire (D)	$ 55
Poker Sam (D)	$ 17
Jump Man (D)	$ 27
Hellfire Warrior (D,C)	$ 27
Trion (D)	$ 27
Adventure in Time (D)	$ 20
Wavy Navy (D)	$ 23
Final Orbit (CT)	$ 23
Pharoah's Curse (D,CT)	$ 23

Order NOW For Christmas

To Order Call Toll Free 1-800-634-6766

Information & Inquiries 1-702-369-5523 • We accept VISA and MasterCard

*ORDERING INFORMATION AND TERMS: For Fast Delivery send cashier checks, money orders or direct bank wire transfers. Personal and company checks allow 3 weeks to clear. Charges for C.O.D. orders are $3.00 minimum or 1% for orders over $300. School purchase orders welcomed. Prices reflect a cash discount only and are subject to change without notice. Please enclose your phone number with any orders. **SHIPPING: — Software:** $3.00 minimum. **SHIPPING — Hardware:** (Please call) **SHIPPING — Foreign Orders:** APO & FPO orders: $10 minimum and 15% of all orders over $100. Nevada residents add 5 3/4% sales tax. All goods are new and include factory warranty. Due to our low prices, all sales are final. All returns must be accompanied by a return authorization number. Call 702-369-5523 to obtain one before returning goods for replacement.*

CASTING CHARACTERISTICS *continued from page 92*

```
500 REM ** TELL HOW TO DO AGAIN
510 PRINT
520 PRINT "TO DO AGAIN, PRESS SPACE"
530 OPEN #1,4,0,"K:"
540 GET #1,KEY
550 IF KEY<>ASC("  ") THEN 540
560 CLOSE #1
570 GOTO 210

900 REM ** DICE SUBROUTINE
910 D1=INT(6*RND(0))+1
920 D2=INT(6*RND(0))+1
930 D3=INT(6*RND(0))+1
940 DICE=D1+D2+D3
950 RETURN
```

3D6

It's easy to modify this program for D&D or T&T. Change only lines 320 and 370. To make it even easier, include the number of traits (characteristics) in the DATA statement. For our program, make these changes:

```
310 READ NT
320 FOR K=1 TO NT

370 DATA 7,STR,CON,SIZ,INT,POW,DEX,CHA
```

Now for D&D or T&T, change *only* line 370.

There's always another way, Change only block 300 as follows:

```
300 REM ** ROLL & DISPLAY CHARACTER
310 READ TRAIT$
320 IF TRAIT$="ZZZ" THEN 510
330 GOSUB 910
340 PRINT TRAIT$,DICE
350 GOTO 310
360 NEXT K
370 DATA STR,CON,SIZ,INT,POW,DEX,CHA,ZZZ
399 REM
```

There's always another way. Instead of storing the characteristic abbreviation in a DATA statement, pack them into a string. In our first program, rewrite blocks 100, 200, and 300 as follows:

```
100 REM ** CREATE A CHARACTER
110 DIM ABBR$(21),TRAIT$(3)
120 ABBR$="STRCONSIZINTPOWDEXCHA"

200 REM ** GET READY
210 PRINT CHR$(125)

300 REM ** ROLL & DISPLAY CHARACTER
310 FOR K=1 TO 7
320 TRAIT$=ABBR$(3*(K-1)+1,3*K)
330 GOSUB 910
340 PRINT TRAIT$,DICE
350 NEXT K
370 DATA STR,CON,SIZ,INT,POW,DEX,CHA,ZZZ
```

For D&D or T&T, change only lines 120 and 310.

```
D&D  120 ABBR$="STRCONINTWISDEXCHA"
T&T: 120 ABBR$="STRCONIQ LK DEXCHR"
```

Yes, put spaces here. Why?

Again, to make changes even easier, rewrite line 310 like this:

```
310 FOR K=1 TO LEN(ABBR$)/3
```

There's alaways another way. We suggest two for *you* to write.

1. Suppose we write block 100 as follows:

```
100 REM ** CREATE A CHARACTER
110 DIM ABBR$(24), TRAIT$(3)
120 ABBR$="STRCONSIZINTPOWDEXCHAZZZ"
```

ZZZ

We want you to use that ZZZ in your rewrite of block 300, but don't use a FOR-NEXT loop.

2. Write a program that lets the *user* select which game to roll for. It might begin like this:

```
I CAN ROLL A CHARACTER FOR:
  DUNGONS & DRAGONS (D)
  RUNEQUEST         (R)
  TUNNELS & TROLLS  (T)
WHICH GAME (D, R, OR T)?
```

If you press D, R, or T, you get a character using the abbreviations for that game. To go again, press the space key.

THE CAREFULLY CONTRIVED CHARACTER

Instead of asking you to use dice to roll up a character, a GameMaster might give you a certain number of points to "spend" on the seven characteristics.

You may assign 3 to 18 points for any one characteristic, but the total must add up to the number given you by the GM. We have written a primitive *worksheet* program to help you do this. When you run it, first you see this:

```
1 STR          0
2 CON          0
3 SIZ          0
4 INT          0
5 POW          0
6 DEX          0
7 CHA          0
TOTAL POINTS:  0
CHANGE (1 TO 7)?
```

You may select which characteristic to change by pressing a number key from 1 to 7. The computer then asks:

continued on page 96

THE PROGRAM STORE

Guarantee: We will ship your order for items in this ad within 48 working hours or you get a 20% rebate. (Books/non-released items excluded. Gift certificate issued. Offer expires October 31, 1983)

SPELLICOPTER™

DesignWare

Become a spelling ace as well as an ace chopper pilot with this action learning game for ages 6 to adult. Rescue the secret word, letter by letter using the context clue at the bottom of the screen. Comes with spelling lists with 400 words. Because you can create your own word lists and clues, it's perfect for practicing each week's spelling lesson. Lively sound effects, graphics and animation make learning fun!

Atari 48K Disk $39.95



CREATURE CREATOR

DesignWare

Do the Monster Match! This computer discovery game for ages 4 to 8 years is a challenging matching activity. Hours of entertainment as individuals or groups create thousands of different combinations of heads, acms, bodies and legs. Creatures can be animated with dancing steps just by pressing 6 keys. Simple on-screen instructions help children learn concepts of computer programming and pattern recognition.

Atari 48K Disk $39.95



CRYPTO CUBE

DesignWare

A three-dimensional word game, includes ready-to-solve puzzles for all proficiency levels and ages from 8 to adult. The 50 topical puzzles are interesting for everyone. Since players can type in their own words, it's the perfect way to gently lead children to greater vocabularies. The built in puzzle generator turns new lists into puzzles. What a challenge!

Atari 48K Disk ~~$39.95~~
20% OFF SALE
Now til Nov. 30
$31.96



KID GRID

by Arti Hartounian from Tronix

It's the wildest, wackiest videochase this side of the arcades. Your job is to connect all the dots on the colorful grid. Easy, right? Pac-Man looked easy too! It's harder than it looks because the bullies are in hot pursuit! Squashface, Thuggy, Muggy and Moose are all in the game. If they catch you, the results are explosive. So keep your eyes peeled for the mysterious bouncing question mark and don't slow down!

43524 Atari 16K Tape ~~$29.95~~
43535 Atari 16K Disk ~~$29.95~~
15% OFF SALE Now til Nov. 30 $24.45

COLOR DISKETTES

GET ONE COLOR DISKETTE FOR ONLY $1.00 WITH THIS COUPON AT ANY OF OUR PARTICIPATING STORES (coupon not redeemable through mail order)

The whole disk is colored — not just the envelope! It's so hard to describe, we want you to see it. Try these premium quality disks in 5 bright colors. Try a different color for each subject or person. Available in boxes of ten, all one color for $34.50. OFFER EXPIRES NOV. 30, 1983

#40262 Green #33242 Orange
#37460 Red #29865 Yellow $34.50
#33534 Blue
#18515 Assorted Colors $39.50

Name ______________________

Address ______________________

City __________ State __________ Zip __________

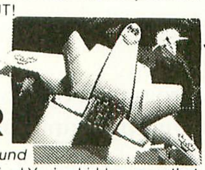
Type of Computer ______________________ 02

WAYOUT

by Paul Edelstein from Sirius

1983 Golden Joystick Award for best graphics! Bizarre 3-D scrolling action mazes! Select from 26 incredible journeys. You'll have a compass and a map of your travels at the bottom of the screen. Save 9 different locations or the entire game. You must avoid the mischevious hiding Cleptangle. Keep your eye on the fireflies, they'll show you which way the wind's blowing in the maze and maybe even give you a clue to the WAYOUT!

44075 Atari 32K
Disk $39.95



SKYBLAZER

by Tony Suzuki from Broderbund

Stand by for brilliant aerial action! You've hidden away that vintage WWIII jet which you'll need to clear away radar stations, avoid supersonic tanks, find and destroy ICBM installations, escape heat-seeking missiles and explosive sky mines. Make your final bomb run on the Bungeling Empire Headquarters! Joystick controlled.

34928 Atari 48K Disk ~~$31.95~~
20% OFF SALE Now til Oct. 31 $25.56

MATCH-BOXES



by Al Cheser from Broderbund

An antimated game for the family! Lurking behind a grid of 36 numbered boxes is an animated menagerie of colorful characters, creatures and objects, each with a catchy tune all its own. Uncover boxes two at a time to match pairs of light and sound to solve a hidden word puzzle. Seven different games for 1 or 2 players. A delight for the eyes, ears and intellect!

34265 Atari 32K Tape $29.95
23814 Atari 32K Disk $29.95

DEEP BLUE C COMPILER

by John H. Palevich from APX

This implementation of the Small C language fills the gap between BASIC and assembly language. C is more powerful and faster than BASIC yet clearer and less error-prone then assembly language. Now you can create C programs on your Atari- ones that contain more than a hundred lines of code. Includes a library of commands and user manual which eases the transition to C. Requires Atari Program Text Editor or other non-line oriented text editor.

24141 Deep Blue C Atari 48K Disk $39.95
28796 Program Text Editor Atari 32K Disk $39.95

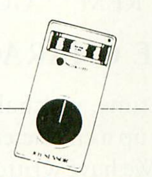
THE C PROGRAMMING LANGUAGE

by Brian W. Kerrighan and Dennis M. Ritchie from Prentice-Hall

This is the first available text on the rapidly developing C programming language. It offers a detailed yet understandable explanation of all aspects of the C language. Incorporating examples that are complete programs, the text not only teaches the language but demonstrates useful algorithms, data structures and programming techniques.

Softcover Book $17.95

SPECIAL PRICE ALL THREE FOR $77.85 A $20.00 SAVINGS!

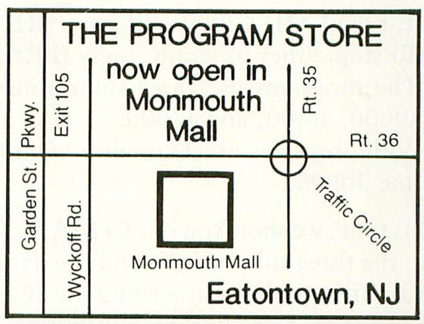


JOY SENSOR

from Suncom

Exciting breakthrough in game controllers! Touch sensitive with no stick. Just the right combination of control and responsiveness. Includes switch to move only in horizontal and vertical or all eight directions. Moves are executed much faster — the slightest touch is all it takes.

31059 Atari Joy Sensor $34.95



Over 2500 Programs for TRS-80, ATARI 400/800, APPLE, IBM, VIC 20 & C64

VISIT OUR STORES

Tenley Mall, 4200 Wisconsin Ave., NW, Washington, DC
Harvard Square, 13 Dunster St., Cambridge, MA
W. Bell Plaza, 6600 Security Blvd., Baltimore, MD
White Flint Mall, Rockville Pike, Rockville, MD
Cherry Hill Mall, Rt 38 & Haddonfield Rd, Cherry Hill, NJ
Monmouth Mall, Rt 35 & Wyckoff Rd, Eatontown, NJ
Willowbrook Mall, 1400 Willowbrook Mall, Wayne, NJ
Nanuet Mall, Rt 59 & Middletown Rd, Nanuet, NY
Olentangy Plaza, 829 Bethel Rd, Columbus, OH
Westmoreland Mall, Rt 30 East, Greensburg, PA
Montgomery Mall, 230 Montgomery Mall, North Wales, PA
Plymouth Meeting Mall, 500 Germantown Pike, Plymouth Meeting, PA
Century III Mall, SR 51 & SR 885, West Mifflin Borough, PA
Seven Corners Center, Falls Church, VA

COMING SOON IN

CHICAGO, ST. PETERSBURG, DENVER, TAMPA, OKLAHOMA CITY, TULSA

FRANCHISE OPENINGS IN SELECTED CITIES

To Order Call Toll Free 800-424-2738
For Information Call (703) 556-9778

Mailorders: List computer, item, item #, qty, tape/disk, rom, book, price, shipping, tax & total
Send check or M.O. for total purchase plus $2.00 shipping and handling. VA add 4% sales tax
Charge cards — include all embossed information. List name, address, city, state, zip & phone

THE PROGRAM STORE®

THE PROGRAM STORE Dept. 02-11-3 Box 9582 4200 Wisconsin Avenue, NW Washington, D.C. 20016

CASTING CHARACTERISTICS *continued from page 94*

NEW VALUE?

Type the new value and press [RETURN]. The new value appears on screen along with a new TOTAL POINTS. You can select a characteristic and enter a new value as many times as you want until you get just the character you want, with exactly the number of TOTAL POINTS the GM said you could have.

When the computer asks: CHANGE (1 TO 7)?, you may start over by pressing the zero [0] key.

Next time, we will show you our program. In the meantime, write your own. We suggest you store the values of the characteristics in an array. Here is an outline for our program.

```
100 REM ** CONTRIVE A CHARACTER
200 REM ** SET ARRAY TO ZERO
300 REM ** SET TOTAL POINTS TO ZERO
400 REM ** DISPLAY WORKSHEET
500 REM ** CHANGE WHICH ONE?
600 REM ** NEW VALUE
700 REM ** COMPUTE TOTAL POINTS
800 REM ** GO AROUND AGAIN
```

THE CHARACTER FILE

Last time, we challenged you to write two programs, one to look up a character record and one to scan the entire character file. We have written both programs so they can be in memory at the same time.

- CHARACTER FINDER begins at line 1000. To run it, type RUN and press [RETURN].
- SCAN CHARACTER FILE begins at line 2000. To run it, type GOTO 2000 and press [RETURN]
- To stop either program, press [BREAK]
- The programs use three subroutines, located at lines 10000, 11000, and 12000.
- Both programs use a common *data base*, beginning at line 30000.

This time, we show you our CHARACTER FINDER program, the three subroutines, and the data base of character records. Try your hand at writing the SCAN CHARACTER FILE program. Use our three subroutines to make your task easier.

```
1000 REM ** CHARACTER FINDER
1010 DIM NAME$(30),WHO$(30)

1100 REM ** ASK FOR NAME, WHO$
1110 PRINT CHR$(125)
1120 PRINT "NAME OF CHARACTER";
1130 INPUT WHO$

1200 REM ** LOOK FOR WHO$
1210 RESTORE
1220 GOSUB 11010:REM GET A RECORD
1230 IF NAME$<>WHO$ THEN 1310
1240 GOSUB 12010:REM DISPLAY RECORD
1250 GOTO 1410

1300 REM ** CHECK FOR EOF (ENDFILE)
1310 IF NAME$<>"ENDFILE" THEN 1220
1320 PRINT "I DON'T KNOW ";WHO$

1400 REM ** TELL HOW TO DO AGAIN
1410 GOSUB 10010:REM DO AGAIN SUBR.
1420 GOTO 1110

2000 REM ** SCAN CHARACTER FILE
```

You write the SCAN CHARACTER FILE program. Use our subroutines and data base, below.

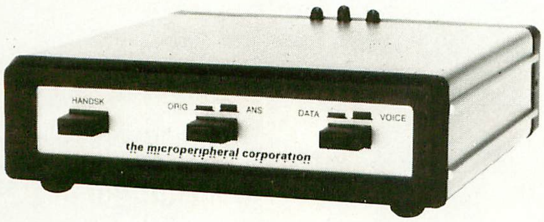
```
10000 REM ** DO AGAIN SUBROUTINE
10010 PRINT
10020 "TO DO AGAIN, PRESS SPACE"
10030 OPEN #1,4,0,"K:"
10040 GET #1,KEY
10050 IF KEY<>ASC(" ") THEN 10040
10060 CLOSE #1:RETURN

11000 REM ** GET RECORD SUBROUTINE
11010 READ NAME$
11020 READ STR,CON,SIZ,INQ,POW,DEX,CHA
11030 RETURN

12000 REM ** DISPLAY RECORD SUBROUTINE
12010 PRINT CHR$(125)
12020 PRINT NAME$:PRINT
12030 PRINT "STR",STR
12040 PRINT "CON",CON
12050 PRINT "SIZ",SIZ
12060 PRINT "INT",INQ
12070 PRINT "POW",POW
12080 PRINT "DEX",DEX
12090 PRINT "CHA",CHA:RETURN

30000 REM ** DATA BASE
30010 DATA ALOYSIOUS
30011 DATA 10,11,10,12,10,12,9
30020 DATA BAROSTAN
30021 DATA 17,17,13,8,7,15,6
30030 DATA BRIDLA
30031 DATA 11,12,10,15,6,11,16
30040 DATA DERNFARA
30041 DATA 13,13,8,13,4,17,6
30050 DATA JOLEEN
30051 DATA 13,11,7,13,8,17,13
30060 DATA ROKANA
30061 DATA 9,9,9,17,18,9,10
30070 DATA ENDFILE
30071 DATA 0,0,0,0,0,0,0
```

Modem with Printer Interface for Atari, Commodore, and Vic



Direct connect, autodial, autoanswer modem, also runs a parallel printer. 300 baud modem has built in Centronics printer port. Simultaneously prints whatever appears on your screen as it comes over the telephone.

One box does it all so you can receive the most from your computer. Terminal program supplied, complete and ready to run.

Auto-Print Microconnection retails for $149.95.

the microperipheral corporation
2565 - 152nd Avenue NE, Redmond, WA 98052
(206) 881-7544

GAME PLAYERS
A New Game
from
Looking Glass Software

LILY PAD

It's not easy being an industrious frog named Fred, hopping from lily pad to lily pad, happily changing their colors from green to red to orange, so you can advance to the next level. There is a menacing oatmeal cookie who's out to catch you, and an annoying blueberry who wanders around changing the lily pads back to green, and there's always the danger of falling off the lily pads. It may not be easy but its fun, . . . and so engrossing that you'll find it hard to stop once you've started playing.

48K Atari Computer W/BASIC Required

$29.95*

30-day warranty against material defects.

MATHPACK • LETS SPELL • LETS PAINT
Also Available at **$29.95*** per title.

SUPER UTILITIES
Also available at **$49.95***.

Send Check or Money Order To:
LOOKING GLASS SOFTWARE
544 Fort Laramie Dr., Sunnyvale, CA 94087
(408) 733-7901

*Add $3.00 shipping and handling. California residents add sales tax.

CASADAPTER
"IT REALLY WORKS!"

CASADAPTER is a cassette interface that allows you use your own cassette recorder or stereo with the Atari 400/800/1200®. **CASADAPTER** will handle motor control, audio and data channels.

$34.95

48K RAM BOARD FOR: THE ATARI 400®.

$115.00

SCP SAR-AN
COMPUTER PRODUCTS

12 Scamridge Curve
Buffalo, New York 14221
(716) 632-3441

Dealer Inquiries Invited

*Product of Gemini Software

Add $2.50 shipping.
Send check or money order
C.O.D. accepted
New York State Residents add 7% tax
®Atari is a trademark of Atari, Inc.

***MAGIC DUMP** is a screen dump utility that allows you to dump a Hi-Resolution graphics picture to a printer in a variety of different sizes. **MAGIC DUMP** is used in the RIGHT hand cartridge slot, so it is always ready to use.

MAGIC DUMP will work with all Epson printers and Gemini printers, the Centronics 739 printer, and the Prowriter or N.E.C. printers. **$59.95**

***GTIA DRAW** is a drawing program that uses all the features of Atari's® new GTIA chip. **GTIA DRAW** will give you three extra graphics modes, Mode 9 (16 luminances and one color), Mode 10 (8 luminances and color), or Mode 11 (16 colors and one luminance).

GTIA DRAW will allow you to:

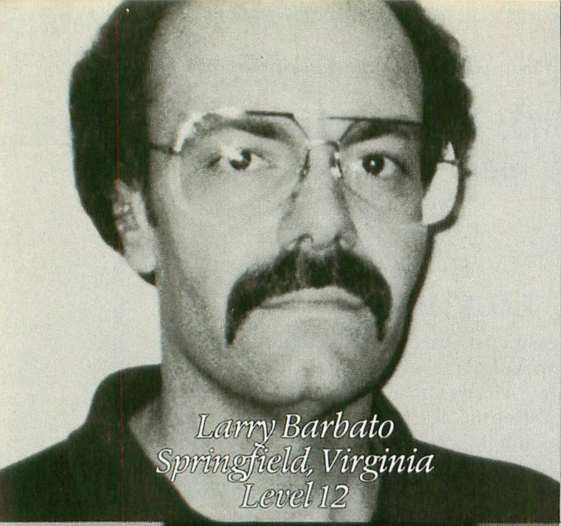
- Add text to pictures
- Blank horizontal or vertical lines
- Shift the screen in any direction
- 'ZOOM' in on certain areas of a picture
- Fill portions of a screen
- Work on two different screens simultaneously

$49.95

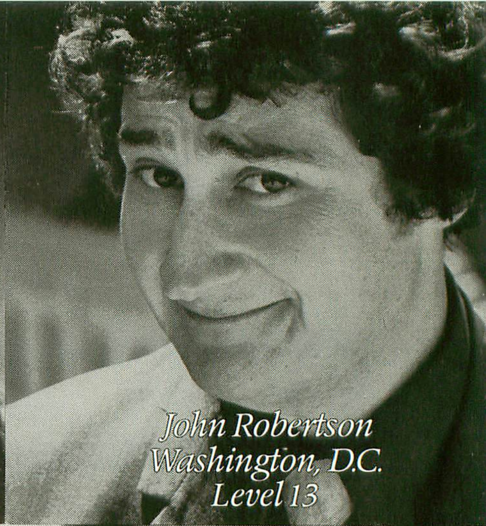
***THE DRUMESISER** is a unique sound synthesizing tool that allows the creation of sounds such as a drum, piano, organ, harpsichord, or electronic synthesizers. The different types of sounds created are limited by the user's imagination and ambition.

THE DRUMESISER comes with an Editor, which allows you to create your own sounds, a Player, which will allow you to play the different instruments, and the Memory Options, which make it possible for you to playback any sounds that you have recorded.

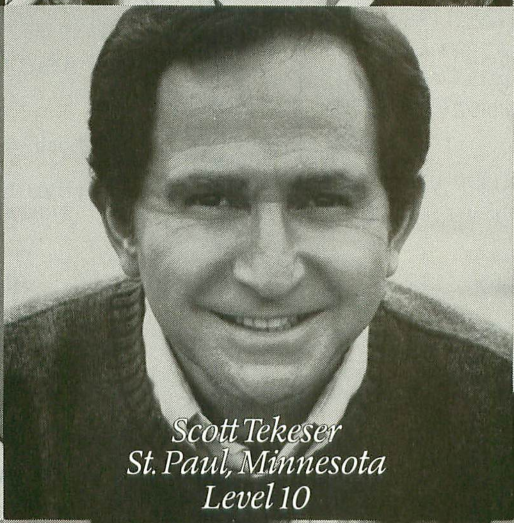
$49.95

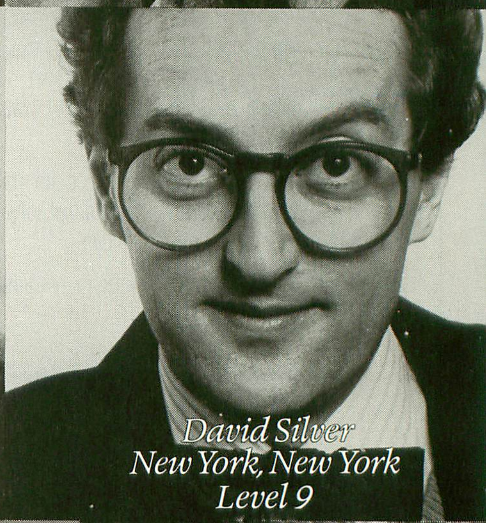

Larry Barbato
Springfield, Virginia
Level 12

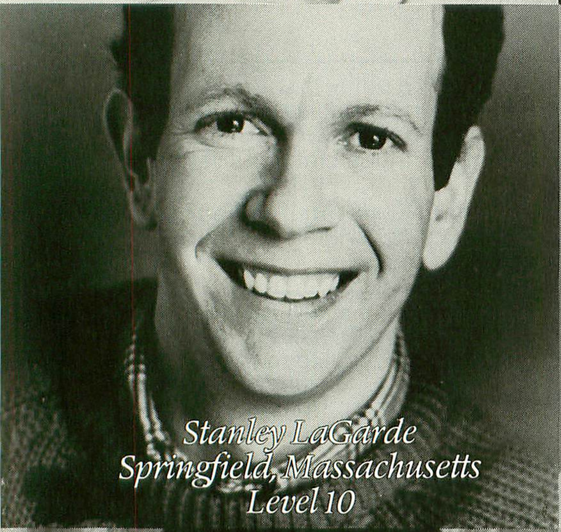

Cindy Horne
Portland, Oregon
Level 11

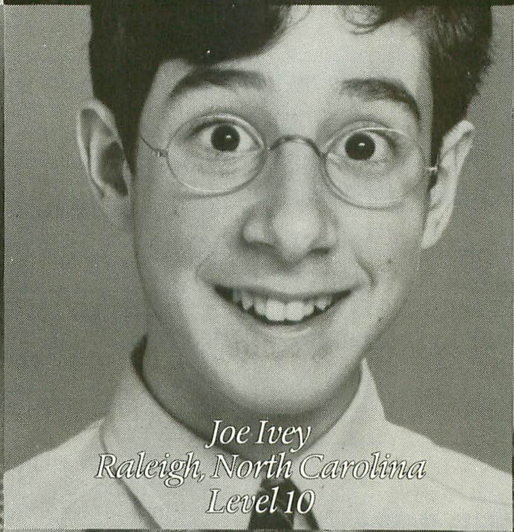

John Robertson
Washington, D.C.
Level 13

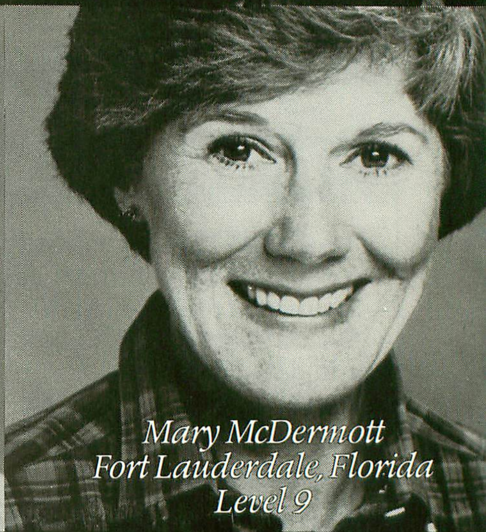

Mark E. Renne
Bozeman, Montana
Level 14

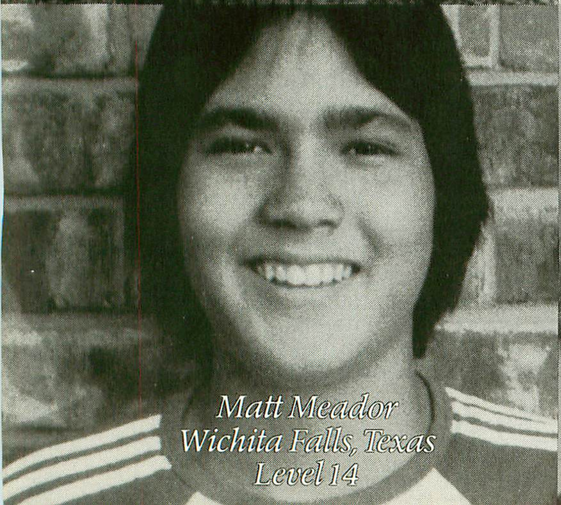

Scott Tekeser
St. Paul, Minnesota
Level 10


David Silver
New York, New York
Level 9

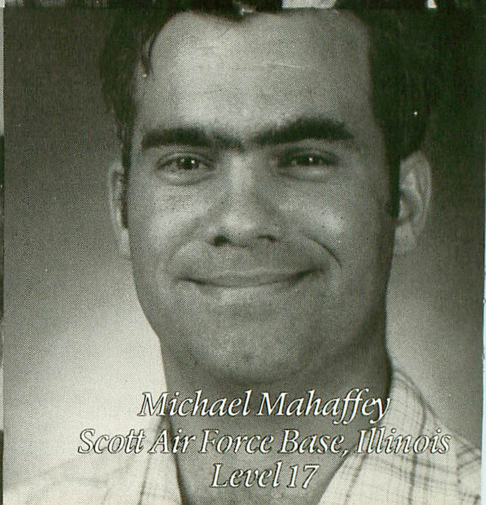

Stanley LaGarde
Springfield, Massachusetts
Level 10


Joe Ivey
Raleigh, North Carolina
Level 10


Mary McDermott
Fort Lauderdale, Florida
Level 9


Matt Meador
Wichita Falls, Texas
Level 14


Jean Cole
San Diego, California
Level 13


Michael Mahaffey
Scott Air Force Base, Illinois
Level 17

The 12 Strongest People In The World.



You may know them as students, doctors, office workers, lawyers. But don't let that fool you. They are the *Warriors of Ras*.™

At will, they can enter the world of Ras. A world where sorcery is real and heroics are commonplace. It is there that you'll find the four challenging new computer role-playing games: *Dunzhin, Kaiv, Wylde* and *Ziggurat*.

You can join them, pitting your mind and reflexes against mazes filled with creatures that are more threatening at every turn. Turns that become more treacherous with every step. And with each triumph you become stronger, faster, wiser.





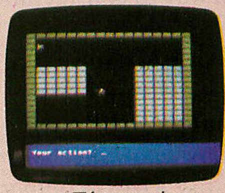
Dunzhin



Kaiv



Wylde



Ziggurat

All games are for Atari and Commodore 64. Dunzhin is also available for Apple and IBM PC.

Even better, you can carry your experience from one game in the *Warriors of Ras* series to the next. You may need to. *Dunzhin, Kaiv, Wylde* and *Ziggurat* are increasingly difficult.



So sharpen your sword. You could become the first Level 20 Warrior. The strongest in the world.

And all the while even your best friends may never know what's happened to you.

screenplay™

Box 3558, Chapel Hill NC 27514 800-334-5470

The ultimate challenge from Screenplay is coming. Play, and you could win $10,000.

MISSION ACCOMPLISHED

'De Buggers Bit3 Dust

by DAVE and SANDY SMALL

As you may recall from our last article, we are discussing the development of a commercial game product and the techniques we used to get the job done very quickly. You can apply these same techniques to save yourself time (and thus money) in your projects.

Last month we explained why we chose MAC/65 over the other assemblers available for the ATARI. Now that we have picked an assembler, we can write the program and generate machine language. Ah, but we have to *debug* machine language. Remember, debugging time = 1.5 × programming time. If you are doing development work, debugging costs you a great deal of time. We found a way to considerably cut the time involved.

The problem we solved in a unique way was that of debugging the assembly language program. It was quite long (25K), and contained a number of different displays utilizing scrolling, P/M graphics, and display lists changing dynamically. The problem is, how do you debug such code?

There are a number of popular debuggers on the market. There's Dunion's **DDT**, a powerful debugger for the Atari Macro Assembler. There's Dave Young's **OMNIMON**, a ROM-based monitor utilizing a patched Operating System board. There's **MAE**, **BUG/65**, and so forth. Last, and least, there's the crude and annoying debugger in the **Atari Assembler/Editor** cartridge.

I'll bet you can guess from my description which one we used. Yup, the ASM/ED cartridge. "Why?", you ask. I'll answer that in a minute, but first, some background information.

There is a problem common to all of the debuggers currently on the market: they use the TV screen for display.

This is *not* a trivial consideration to a game writer. You program ANTIC to create a given visual display. This display is then shown on the TV. But while that display is there, you cannot get any information about memory, the 6502, ANTIC, collision status, or anything else, because the TV screen is already being used. This makes debugging of dynamic displays, where things are going on during this display process, nearly impossible; you need to be able to talk to the debugger to find out what's going on, but the debugger can't output anything to you.

Presently, there are two rather kludgey solutions. Both involve giving you a way to get information from the debugger without conflicting with the TV display you are generating.

The first is to redirect console (E:) output to the printer, via C364(A6,EE (from the ASM/ED debugger). This makes anything that normally would be printed out on the screen get typed out on the printer instead. Hence you can get output from your debugger, at the expense of a considerable quantity of paper. For instance, if you have your display up on-screen, and there are too many scan lines being generated, you can dump the display list off to the printer to find out what's going on, and why too many lines are on-screen.

This solution has drawbacks, however. It assumes you have a respectable supply of paper and are willing to put up with a (relatively) slow printer output as compared to a CRT output. You can't see what you're typing on the keyboard, so if you make a mistake, you won't find out about it and can't correct it. And just to make things interesting, in order for the printer to even function, both CIO and SIO must be initialized and running, which means a number of low memory locations need to be set and not altered by your code. One quick example would be the sound registers, used by SIO.

The other solution, utilized by many debuggers, is to "flip" out the current display, by rewriting ANTIC's display

---

Dave and Sandy Small are professional programmers working with ATARI computers and ATARI-compatible peripherals and software to produce commercial software to run on ATARIs. They begin here to share some discoveries, insights, experiences and secrets of interest to others at or near their level of practice. Each article is intended to stand alone, but articles are sequential and full value may depend on reading the whole series. Questions or suggestions can be addressed to them care of ANTIC. Responsive answers are not guaranteed, but may be made individually by mail (if self-addressed stamped envelope is provided) or publicly in this department. —ANTIC ED

list shadow registers, onto a "debug" display, where all sorts of registers, breakpoints, and memory locations are shown. When you are done with the debug display, you "flip" back to the original display. This too has its problems, which is why we didn't go this route either. The main drawback is that you cannot see the debugging display and the TV display you are working on at the same time.

A case in point: Let's say we are attempting to debug a display where a player can collide with a terrain playfield. We would like to debug it by checking the collision registers, by hand, when the player is being plotted on top of the terrain it should collide with. Well, with the "page flip" debugger displays, you can't do that, because the instant the text debugger window pops up (probably with your players still running), your collision registers take on amazingly random values.

Or perhaps you are debugging a display list interrupt? A DLI does not even *happen* unless your original display is on-screen. We are using at least one and as many as five DLI's on every screen.

The problem remains that you just can't get debugging information out of the machine and have your TV display, to be debugged, up there also. There's only one CRT information path out of the ATARI, and that's ANTIC.

Until, of course, Bit3 came out with their 80-column card. The Bit3 board plugs into the rear RAM slot of the ATARI 800 and has a complete 80-column video circuit inside. It generates a signal for a monochrome monitor which you attach to it. (Incidentally, color monitors specifically made for high resolution work will not suffice. I can remember one review of the Bit3 board which was very negative because the reviewer hooked it up to a color monitor, and the Bit3, of course, could not generate a legible image.) You will need a 32K card to make up for the lost 16K RAM slot; Mosaic has a particularly convenient adaptor which takes the RAM chips from two Atari 16K memory boards and reuses them in one Mosaic board, for 32K.

At first we used the 80-columns for word processing, until we moved to CP/M and Wordstar. The Bit3 board remained retired for a while, until this debugging came up and we realized the power it could offer in debugging. (Certainly this application has never been advertised.) What is Bit3's special potential? The board provides an alternate path for debugging output.

This means you can have your TV displaying whatever ANTIC and GTIA are up to in terms of the game screen, and have your Bit3 & 80-column monitor displaying debugging information *at the same time*.

This is a tremendous debugging tool. It is the most powerful debugging tool I have seen for the ATARI with the exception of a hardware logic analyzer. For instance:

If I want to watch collision registers, I can wait until the game reaches the collision point, stop the game (via [BREAK]), and using the Bit3 board as output, display the registers. The TV display at this point is static, busily displaying players and playfield, and most importantly, having GTIA set collision registers. The ANTIC display is unaffected by the debugger, which is working with the Bit3 board, not the TV display.

Our game screens had terrain maps of many colors. Making all the colors match for a nice overall display takes a great deal of time, normally. However, with the Bit3 & debugger, we could change the color register values immediately, and see the results on the TV. We could also change colors inside of DLI handlers (as we segmented the screen vertically many times) directly, to get the colors right. This saved us many reassemblies with the large amount of time they eat up.

I will skip the descriptions of many, many other situations where the power of two displays, one watching the 6502 and memory, and the other being the ANTIC-generated TV display, made the debugging go much faster. I would estimate this technique cut two weeks of frustrating debugging time out of our project, by greatly easing the debugging task.

And, this brings us to why we used the very crude ASM/ED debugger: it works with the Bit3 board. DDT does not. OMNIMON does not. It takes a debugger that uses CIO and E: for output, which Bit3 redirects to its 80-column circuitry, to work properly. The cartridge was the only debugger we could find that did so.

To be sure, we are not masochists. We would not use the ASM/ED cartridge for debugging if we had any choice. Only because there was no alternative did we reluctantly dig the cartridge out of our junk box. By doing so, we subjected ourselves to a number of bad features. The cartridge:

- Uses lots of Page Zero locations, so you can not use those locations without having the cartridge trip over them. To make things worse, the locations that are used are not documented properly in the ASM/ED manual.
- Does not trace through a CPY #nn instruction. This is extremely annoying, as indexing is a key to nearly any 6502 program. This bug can be gotten around, however; do something like this:

```
          CPY EIGHTEEN

EIGHTEEN  .BYTE 18
```

instead of

```
CPY #18.
```

- Resets vertical blank vectors (without telling you) on any [BREAK] key press or (00) BRK instruction, so you can not debug them properly; we had to use DLI's go get around this.
- Is not relocatable and takes up 8K in high memory.

But, even with all of these problems, the independent display of the Bit3 and the ASM/ED cartridge made it all worthwhile.

There are a few things you should know about when using this combination. First, the Bit3 board, to quote Elmer Fudd, is "Tewwibly, tewwibly sensitive" about a number of things. To begin with, you must not alter DINDEX or the cursor display locations, ROWCRS/COLCRS, as Bit3 uses those to figure out current Graphics Mode (0–11) and cursor location. If the Bit3

continued on next page

board thinks that you are no longer in Graphics 0 text mode (DINDEX = 0), you're out of luck; it shuts itself off. And if you alter the cursor registers (example, if you draw a line on-screen using the OS draw routines), then the Bit3 will get confused as to where it should output data. In my case, I was using a GR. 8 display and drawing lines, which set DINDEX to 8 and threw the cursor values down to around 100; the Bit3 board went wild.

Next, the Bit3 board uses the lowest 32 bytes of the stack area as temporary memory. The idea here is that the lower part of the stack never gets used (unless a program is not returning from subroutines properly and is about to crash anyway), thus, this area is available as free storage. This use of Page One is both good and bad. The "good" is that Page Six, Page Four and other popular places to stash things are used, so you don't have conflicts. (Ever noticed how every other utility on the market seems to use Page Six, making them all mutually exclusive?)

The "bad" is that MAC/65, the extremely powerful assembler we were using, *ALSO* uses the lower part of the stack when assembling, and will crash if used with an 80-column board. So for some time we had to switch out of 80-column mode to do an assembly. Finally, however, OSS gave us a fix; all references to the lower stack area were moved up $20 bytes, into the not-so-low stack area. (Oh, well). All then worked fine. (Buyers of OSS products should note that the support for these products is among the best I have seen in the Atari market).

Finally, in the "Twilight Zone" series of weird debugger problems, unless an initial "JSR" is made to whatever code you are trying to debug, to move the stack pointer off the very top of the stack, you will spectacularly crash on any [BREAK] key press or 00 (BRK) instruction. I don't know why; I have my speculations about the 6502 using locations $100 and $1FF for storage if it is at the very top of the stack, but don't know. (With the Bit3 board constantly resetting at $100, this seems like a logical reason for this to be the problem.) The easy fix is just to make a JSR the first thing in your program.

Okay, so you have decided to get a Bit3 board. Other advantages are now yours. You can edit your code in 80 columns, which is a whole new world. Why this is important is: 1) you get twice as much information displayed on-screen (1920 chars instead of 960). If you are heavily into comments, as I am, then you will appreciate this greatly; it makes reading and editing go much faster. Just as an example, in 40-col mode, provided you use a number of comments, you will have about 12 lines displayed per screen, because of wraparounds. In 80-col mode, you get 24, plus all the comments are to the right of what they are commenting, versus underneath. Readability and comprehension both increase greatly; if you spend ten less seconds on each display understanding what's going on, you will save hours in the long run. It sure helped us.

MAC/65's powerful editor is compatible with the Bit3 board in editing mode, and with the above fix, in assembly mode.

So, those are our debugging tools. We strongly recommend them to any other programmers who want to get their display-oriented programs debugged quickly.

Next article we will consider your alternatives in disk drives.

HERE'S LOOKING AT YOU, S.A.M.

continued from page 33

```
0100 ; SCREEN DISPLAY SUBROUTINE
0110 ; OUTPUT GR.2 CHARACTERS IN GR.6
0120 ;
0130 ; COPYRIGHT (C) 1983 ROBERT FREEDMAN
0140 ;
0150 ; CALL WITH THE FOLLOWING FROM BASIC
0160 ; ASM=USR(ADR(D6$),ADR(LINE$),LEN(LINE$),PX,PY)
0170 ; PX= X DISPLACEMENT+1, PY=Y DISPLACEMENT+1
0180 ;
0190  *=$630 ; RELOCATABLE
0200 ADRSTR = $CB
0210 SCRMEM = $604
0220 SCRWRK = $CF
0230 LENGTH = $600
0240 XPOS = $601
0250 YPOS = $602
0260 TEMP = $603
0270 OFFSET = $CD
0280 ;
0290  PLA
0300  PLA
0310  STA ADRSTR+1
0320  PLA
0330  STA ADRSTR
0340  PLA
0350  PLA
0360  STA LENGTH
0370  PLA
0380  PLA
0390  STA XPOS
0400  DEC XPOS
0410  PLA
0420  PLA
0430  STA YPOS
0440  DEC YPOS
0450  LDA 560 ; DISPLAY LIST LO
0460  STA $CF ; TEMP ZPAGE LOC
0470  LDA 561 ; DL HI
0480  STA $D0
0490  LDY #4  ; OFFSET FOR SCREEN RAM
0500  LDA ($CF),Y ; GET SCREEN RAM LO
0510  STA SCRMEM ; TO PAGE 6
0520  INY
0530  LDA ($CF),Y ; GET SCREEN RAM HI
0540  STA SCRMEM+1
0550 ;
0560 ; FIND WHERE TO START OUTPUT
0570 ;
0580  LDY YPOS     ; HOW FAR DOWN
0590  BEQ GOON     ; 1ST LINE?
0600 LOOP CLC    ; GET READY FOR ADD
0610  LDA SCRMEM ; BEGIN OF SCR RAM
0620  ADC #20 ; EACH LINE 20 LONG
0630  STA SCRMEM
0640  BCC NEXT ; CARRY?
0650  INC SCRMEM+1 ; YES
0660 NEXT DEY ; DECREMENT COUNTER
0670  BNE LOOP ; CONTINUE MULTIPLY
0680 GOON CLC ; 1 MORE ADD
0690  LDA SCRMEM ; CURRENTLY ON 1ST BYTE OF LINE
0700  ADC XPOS ; X OFFSET
0710  STA SCRMEM
0720  BCC N1 ; CARRY?
0730  INC SCRMEM+1 ; YES
0740 ;
0750 ; FIND BITMAP OF CHARACTER
0760 ;
0770 N1 LDA #00 ; CLEAR TEMP
0780  STA TEMP
0790 NEXT1 LDY TEMP ; COUNTER OF LETTERS OUTPUT
0800  CPY LENGTH ; END?
0810  BCS END ; YES (TEMP >= LENGTH)
0820  LDA #00 ; CLEAR HI OFFSET
0830  STA OFFSET+1
0840  LDA ($CB),Y ; GET LETTER
0850  SEC ; GET READY FOR SUBTRACTION
0860  SBC #32 ; CONVERT TO INTERNAL CODE
0870  STA OFFSET ; OFFSET INTO BIT-MAP TABLE
0880  CLC ; CLEAR FOR X8 MULTIPLACTION
0890  ASL OFFSET ; DO MULTIPLACTION - 16 BIT, X8
0900  ROL OFFSET+1
0910  ASL OFFSET
0920  ROL OFFSET+1
0930  ASL OFFSET
0940  ROL OFFSET+1
0950  LDA OFFSET+1 ; ADD $E000 TO OFFSET
0960  ORA #$E0 ; THIS IS AN ADD!
0970  STA OFFSET+1
0980 ;
0990 ; OUTPUT TO SCREEN
1000 ;
1010  LDA SCRMEM
1020  STA SCRWRK ; TEMP REG FOR OUTPUT
1030  LDA SCRMEM+1
1040  STA SCRWRK+1 ; TEMP REG HI
1050  LDY #00 ; CLEAR Y REG
1060  LDX #6 ; OUTPUT 8 CHAR
1070 OUTPUT LDA (OFFSET),Y ; BITMAP #1
1080  STA (SCRWRK),Y ; OUTPUT #1
1090  INC OFFSET ; NEXT BIT MAP
1100  BNE N2 ; CROSS PAGE BOUNDARY?
1110  INC OFFSET+1 ; YES
1120 N2 CLC  ; CLEAR FOR ADD
1130  LDA SCRWRK ; CURRENT SCREEN LINE
1140  ADC #20 ; NEXT LINE
1150  STA SCRWRK
1160  BCC N3 ; CARRY?
1170  INC SCRWRK+1 ; YES
1180 N3 DEX ; ONE MORE DONE
1190  BPL OUTPUT ; ALL 8 OUTPUT? NO -
1200 ;
1210 ;NEXT LETTER
1220 ;
1230  INC TEMP ; NEXT LETTER
1240  INC SCRMEM ; NEXT SCREEN LOCATION
1250  BNE N4 ; PAGE BOUNDARY?
```

```
1260  INC SCRMEM+1 ; YES
1270 N4 SEC  ; SET CARRY
1280  BCS NEXT1 ; MAKE CODE RELOCATABL
E ( I COULD KILL FOR BAW (BRANCH ALWAY
S))
1290 END RTS ; THATS ALL FOLKS
```

GOTO DIRECTORY WILL RETURN NEXT YEAR.

ACE POCKET REFERENCE CARD

(reference tool)
ACE
5516 Rosehill
Shawnee, KS 66216
(913) 262-2875
$9.95

Sixteen accordion-fold pages of tables, charts, and definitions, which include a BASIC command list, error codes, a five octave musical pitch table, XIO codes, Player/Missile area layouts, and maybe even the kitchen sink.

IS PIPELINE

(printing buffer)
Interactive Structures, Inc.
146 Montgomery Ave.
Bala Cynwyd, PA 19004
(215) 667-1713
$230.00–$440.00
Price increases in increments of 8K

This printing buffer, which is compatible with any Centronics parallel computer-printer connection, allows for composition, insertion and alteration of information on the way from program to printer. PipeLine can also store typed-in info until the printer is ready to receive it. Memory size starts at 8K, and can be expanded up to 128K.



MOSAIC ADAPTER

(adapter)
Mosaic Electronics
P.O. Box 708
Oregon City, OR 97045
(800) 2 ADD RAM

If you have a few minutes, and three 16K boards, you can easily upgrade your 800 to 48K *and* add an open memory slot for other peripherals. By removing the RAM chips from two of the boards and tucking them into the open socket of the Mosaic Adapter, you will have worked all the magic necessary to obtain a true slot-independent 32K RAM card.

R/128 RAMDISK PRINTER BUFFER SPOOLER

(hardware)
Protronics
21115 Devonshire St.
Chatsworth, CA 91311
(213) 709-2820
$399.95

The R/128K offers 128K of "power backed up" random access memory. It connects to joystick ports and eliminates 850 interface for printer operation. No more waiting for slow printing; rapid data transfer moves at 8K per second. A 512K upgrade kit will soon be available.

OPERATION WHIRLWIND

(game)
Broderbund Software, Inc.
1938 Fourth St.
San Rafael, CA 94901
(415) 456-6424
48K — diskette
$39.95

While we're waiting for WW III, we might as well brush up on our military strategy skills and battle moves. A typical game of O.W. lasts from one to three hours and includes numerous conflicts that propel players on to different sets of actions. Five types of victory are possible, including "questionable," which — perhaps — makes this war game true to real life.

NI858-32

(printer interface)
Newell Industries
3340 Nottingham Lane
Plano, TX 75074
(214) 423-1781
$229.95

An alternative to the Atari 850 interface, this provides RS232 I/O and two parallel printer ports, one of them bi-directional. Comes standard with an 8K spooling buffer (expandable to 32K) that supports both serial and parallel I/O. Also included is the option of simultaneous output of the serial port to the printer.



THE MICROCOMPUTER MARKETPLACE — 1984

(reference book)
Dekotek
2248 Broadway
New York, NY 10024
(212) 799-6602
$75.00

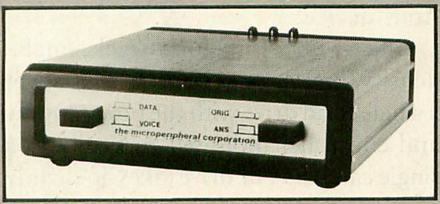
Over 750 pages of in-depth company profiles and cross indexes. Publishers, distributors, manufacturers, software, hardware, clubs, applications, and a monthly calendar of meetings and exhibits fill this compendium. Orders received before Dec. 31, 1983, will get a 20% discount — $59.00 per copy and $3.50 for shipping and handling.

MUSIC I and MUSIC III

(educational programs)
Sunburst Communications
Room Y 4747
39 Washington Ave.
Pleasantville, NY 10570
(800) 431-1934
In New York, Hawaii, Alaska or Canada, call collect:
(914) 769-5030
$39.00 per diskette
$78.00 for both diskettes

Though these are suggested for grades 4–12, they seem to be appropriate for anyone who wishes to learn the language of music. Music I is a program of musical terms and notations in which computer-generated tones and graphics instruct students on music theory concepts. Music III covers the study of scales and chords, triads, and seventh chords. Each program includes a backup diskette and teacher's guide.

NEW PRODUCTS



AUTOPRINT — MICROCONNECTION

(modem)
The Microperipheral Corp.
2565 152nd Ave. N.E.
Redmond, WA 98052
(206) 881-7544
$149.95

This combination modem/printer interface features autodial and autoanswer capability, as well as a built-in Centronics-compatible parallel printer port. Because it plugs directly into the computer, no additional interface devices are necessary. Telecommunications software is provided in the user manual.

LETTER PERFECT and DATA PERFECT

(processors)
LJK Enterprises, Inc.
7852 Big Bend Blvd.
St. Louis, MO 63119
(314) 962-1855
Price adjustment below

Faithful readers of ANTIC will recall coverage of these items in recent issues. This is an announcement of their drop in price.

The word processor, Letter Perfect, previously $199.95 on cartridge and $149.95 on disk, is now $99.95 for both media. Data Perfect, the data processor, has been reduced from $129.95 to $99.95 and is available on disk only.

SOFTWARE EXPRESS

(catalog)
SKU
2600 Tenth St.
Berkeley, CA 94710
(415) 848-0802
$14.95 for consumer version
Call for info on dealership version

Available in two versions, the purpose of this 300 page guide is to help dealers increase software sales. One guide is for dealership use and includes a display and promotional graphics, while the other is for consumer use and comes with discount coupons.

CHATTERBEE

(educational software)
Don't Ask Computer Software
2265 Westwood Blvd.
Suite B-150
Los Angeles, CA 90064
(213) 477-4514
40K — diskette
$49.95

In this game, a spelling bee (of the insect variety) is the guide through various levels of play. Chatterbee speaks through the aid of a built-in version of S.A.M. voice synthesizer, without the need for any additional speech device. The helpful bug not only delivers praise and music; it also tells the player how to spell a word not achieved in three tries, and retests on the missed ones. Designed for grades 1–12, it includes two levels per grade, plus a college level.

OSCAR Model I

(optical scanner)
Databar Corp.
10202 Crosstown Circle
Eden Prairie, MN 55344
(612) 944-5700
$79.95

Oscar Model 1 is a low cost, high speed bar code scanner that interfaces with most home computers, and allows the user to enter programs in less than two minutes. No special adaptors are needed.

A monthly support magazine, Databar, is available for use with Oscar. The premiere issue of this journal comes with purchase of the scanner; however, a subscription costs $10.00 per month and includes membership in the Databar club.

WEIGHTS AND MEASURES

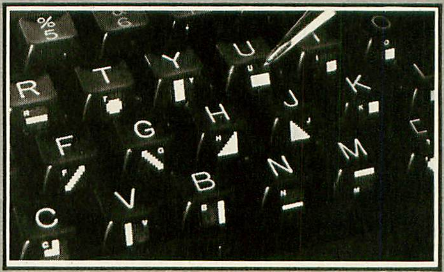
(educational program)
T.H.E.S.I.S.
P.O. Box 147
Garden City, MI 48135
(313) 595-4722
$20.00 — cassette — 16K
$25.00 — diskette — 24K
Include $3.00 for shipping and handling

Here are two programs for the price of one. Children between 4 and 10 not only learn to read scales and rulers, but also learn conversion between pounds and ounces, as well as between yards, feet, and inches. Each of the programs consists of three levels, one of which requires a joystick.

FULMAP

(utility)
VERVAN Software
1953 W. 11th St.
Upland, CA 91786
(714) 946-5805
40K — cassette or disk
$39.95

Fulmap is a 4K 100% machine language cross reference utility for BASIC programmers. It provides a variable cross reference, a cross reference of the constants used, and a map of the line numbers used in a BASIC program. Fulmap also includes a special find-string routine that can be used by assembly language programmers to edit a machine language subroutine in a BASIC program. It also lists "unlistable" BASIC programs. Fulmap works as a stand-alone program, with the BASIC cartridge, or with the Assembler/Editor cartridge.



GRAPH-FIX

(keyboard graphics symbols)
Dovestar Creative Concepts
P.O. Box 2109
Dept. 113N
Nederland, TX 77627
(409) 727-5987
$5.95

So, you want to be a computer Picasso, but have terrible recall of the keyboard graphics symbols? Do not yet take up macrame; Graph-Fix has the answer. These 29 plastic-coated labels fit all ATARI models, and are easily applied to the front face of each key. Hopefully, they will add to your speed and accuracy, and keep you from going into Blue Periods.

VOICE BOX II

The ALIEN Group
27 West 23rd St.
New York City, NY 10010
(212) 741-1770
$169.00, 32K — hardware & disks

Reviewed by Annie Cates

Talking computers, long a presence in science fiction, are now a reality. You can even have one in your own home. Your ATARI computer can sing, talk and curse at you while displaying the face of a customized computer personality on the screen. You can, indeed, even display graphics and animation or text (in any mode) while the Voice Box II talks.

You don't need to be artistic to create a talking face. Voice Box II comes with a face that you can alter to create the perfect persona. While you graphically edit one half of the face, the other half follows the changes and creates a mirror-image likeness. While this limits your ability to create some effects, it certainly saves a lot of time. The lips of your computer face can be synchronized to match the speech or song that you direct it to vocalize. This really helps to create a personality!

If you want to create talking games, you will find instructions that will lead you through the steps necessary to incorporate the voice into the game program. The Voice Box II also comes with a disk that contains five games. You can play a talking version of the well known "Concentration" game, Stud Poker, Spelling, Acey Deucey, or Green Goblins. Jerry White's Stud Poker game is similar to his Poker SAM from Don't Ask. The real gem on this disk is a spelling program written by Ron Kramer. The words are tough — even for adults! Your computer will pronounce the word and ask you to type it on the keyboard. If you spell it incorrectly, you are asked to try again. When you spell it right you are congratulated!

The Voice's speed and frequency are controlled through numbers in the string for vocal output. You can spell phonetically, or in plain English text. The voice is somewhat more difficult to understand than S.A.M. (a software speech synthesizer that disables the ANTIC chip and blanks the screen when it talks), yet it is quite intelligible.

Voice Box II makes a most intriguing addition to any computer. Possibilities with this tool are limitless. You could use this program to wake you up in the morning, alert you to intruders in your home, dial for help in an emergency, or any other thing that catches your fancy. It does take advanced computer knowledge to put those last ideas into practice. However, acquiring that knowledge is half the fun.

The games included with this hardware did not make imaginative use of the voice, (very repetitive) but they did a nice job of demonstrating what could be done!



AT-88 S-I DISK DRIVE

Percom Data Company
11220 Pagemill Road
Dallas, TX 75243
(800) 527-1222
$488.00 (first drive)

Reviewed by Richard DeVore

The Percom AT-88 S-1 disk drive is a less expensive alternative to the Atari 810 Disk Drive. With a list price of $488.00, it is more than $100.00 less than the 810. But saving money is not the only reason to consider the AT-88 S-1. It also performs as well as, if not better than, the Atari device.

The AT-88 S-1 is a forty-track, single-density, first drive system. It consists of a single-head drive with the power supply and controller mounted vertically in a single cabinet. The drive takes up slightly more than one half the shelf space required by the 810 — a significant savings. And, since the AT-88 is designed to be a first drive, it comes with a cable to connect it to the computer.

As is the case with many of the peripherals for the ATARI computer, the AT-88 connects in daisy-chain fashion. This allows it to function with virtually any equipment configuration.

A second version of the AT-88 is available without the controller. The AT-88 A-1 slave unit connects with the AT-88 S-1 via a cable. Up to three slaves can be controlled by a single S-1.

The AT-88 drive has a single rocker switch in back that controls the on/off function. Also located at the rear of the unit, but in its top left corner (with the drive facing you), is an extender board with six blue jumper straps and a terminal DIP. These are used to prepare the drive for the particular equipment configuration you need.

An explanation of how to prepare the extender board is included in one of the best owner's manuals I have ever seen. It is divided into five sections, which include an introduction, a discussion of the unit's twelve possible configurations, and a guide to setting up the configuration you want. The manual also details the proper way to check the system, and concludes by explaning what to do if you have any problems with the unit.

Also included with the AT-88 is a copy of Optimised Systems Software's OSA + Version 2.0 operating system. This OS is compatible with most software written for the ATARI.

I've tested this system's various capabilities extensively, and in every instance programs have loaded and run properly. I've found the AT-88 to be an excellent product, and I recommend it highly.

THE DRUMESISER

Gemini Software/
Sar-An Computer Products
12 Scamridge Curve
Buffalo, NY 14221
(716) 632-3441
$49.95, 16K – Cartridge

Reviewed by George Joel

The **Drumesiser** will greatly interest musicians and other experimenters with sound. Sixteen different instruments, or sounds, can be created and played via the keyboard or through the joystick ports. With this cartridge inserted in an ATARI 800 and the audio output connected to an amplifier and speakers, the computer becomes a respectable live-performance instrument.

Drumesiser's Editor lets you tune each instrument, if you desire. You can set such parameters as pitch, distortion, sustain (fine and coarse), and decay (fine and coarse). Possible sounds are piano, organ, harpsichord, and electric synthesizer. For the ambitious sound enthusiast, the CONTROL setting lets you set the AUDCTL register for each instrument. This is a memory register that gives you a high degree of specialized control over the sound produced by the POKEY chip in your ATARI. See Chabris' "Sound Beyond SOUND," this issue, for more details.

You can also determine which pair (for fast repetition) of keys activates each instrument, or use the PORT feature. This option uses all four joystick ports for inputs, one instrument being activated by each of four positions of each joystick. Of course, any type of input device can be used, providing it sends the proper signals. You can use default settings, in which case different drum sounds will be produced. The program offers fairly convincing imitations of snare drums, cymbals, high-hats, tom-toms, hand clap, cow bell and triangle. The base drum sound is a little weak – understandable, given the hardware's limitations.

You can record in your computer's memory. Systems with 16K will record for 30 seconds, 32K will record for about two minutes, and 48K will record for about three minutes. On playback, you can set the speed anywhere from triple-time to v-e-r-y slow. You can save or load all instrument settings with disk or cassette. If you like, you may also save a recorded tune.

Having this program gave me the impetus, finally, to hook up the audio output from my 800 to the stereo. (See "Ultra Sound," ANTIC, V.1, No. 6 for instructions.) It was well worth the effort. Drumesiser provides a useful tool for the truly creative person who wishes to get the most out of his or her computer.

MPP-1100 PARALLEL PRINTER INTERFACE

Microbits Peripheral Products
434 W. First St.
Albany, OR 97321
(503) 967-9075
$99.95, 16K – hardware

Reviewed by F. Neil Simms

For those of you who are reluctant to shell out the $200 or so to purchase an Atari 850 Interface Module, necessary to drive a parallel printer, this is the product you've been holding out for. The **MPP-1100** is a parallel printer interface that connects to joystick Port Three and any printer using the 36-pin Centronics connector. The cable and connector are included, saving you the $30–$40 cost of purchasing them separately. An adapter is available for 40-pin card-edge applications, including the Atari 825 and Centronics 737 printers.

The interface package includes a replacement ROM that must be installed in place of the existing Operating System ROM (CO12499) containing the printer handler routines. For this modified chip to operate properly, you must also install the Revision B upgrade ROM if you own an older ATARI with the original version. This chip is also available from MPP. To determine which version you have, type ? PEEK(58383) with the BASIC cartridge in place. If the computer returns a '0,' you have Revision B.

These two chips are located on the OS card in the ATARI 800, and on the mother board in the ATARI 400. Installation on the 800 is therefore quite simple: remove the top cover, extract the card and remove the case. Then take out the old chip or chips and insert the new one(s). The 400 is a bit more complicated, as the mother board is enclosed deep within the innards of the machine. However, if the simple, illustrated instructions are carefully followed, anyone with a Phillips-head and a flat-blade screwdriver should be able to complete the job in 15 minutes. If you feel uneasy about going inside the case, have a friend with some electronics experience lend you a hand. Please note, though, that on either machine installation of these chips will void your warranty. The interface package itself is covered for two years.

Connected between my 800 and Gemini 10 printer, the unit has performed flawlessly during several months of heavy use. It has proven to be compatible with all the software that I own; it should work just fine with any application that invokes the printer handler in a legal manner.

This interface is ideal for those who have no use for all those ports on the 850 and who are interested in saving some money.

continued on next page

continued from page 109

CHECKERS

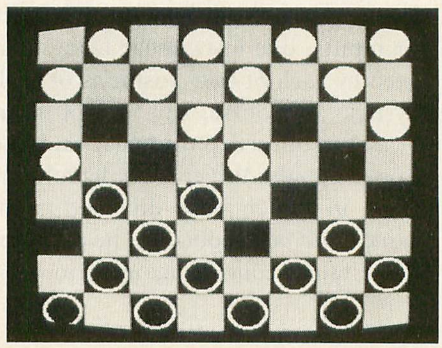
Odesta Software
930 Pitner
Evanston, IL 60202
(312) 328-7101
$49.95, 32K — Disk

Reviewed by Arthur Leyenberger

Occasionally I come across a piece of software that is very well done. Although I am not a checkers expert, it is clear to me that this program is a quality product. Not merely a computer game, **Checkers**, by David Slate, should be thought of as a computer*ized* game. Here's why.

Options include: playing the computer at any of 16 skill levels; using the computer screen to let two people play against each other; asking the computer for advice on your move at any time; having the computer display an instant replay of the entire game ("movie mode"); setting up board positions and continuing play from there; and best of all, watching the computer play *itself* from either a predefined board position or the beginning.

Space does not permit a description of all of the features of Checkers. Instead, I will present a typical game scenario. After booting the game disk, you are presented with several choices. Your pieces are controlled via a paddle or the left/right cursor control keys on the keyboard. Aside from moving the players' pieces, all commands are entered via the keyboard.

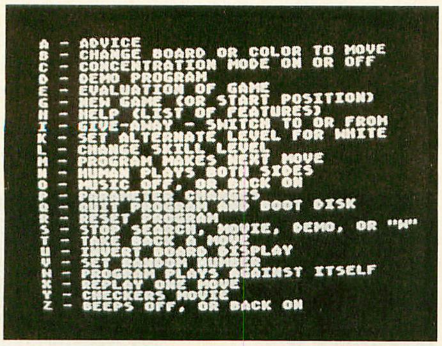


Next you choose to play either white or black pieces. Black always moves first and is the default selection. The player then chooses a difficulty level (skill level) from 0 to 15. The difficulty level determines the amount of time the computer spends "searching" for its move. At any time the STOP command will cause the computer to stop its search and play its best move so far.

Moves are checked for legality. Improper entries are indicated by an audible sound and ignored. In the higher levels, a computer move may take considerable time. A special feature available only on the Atari version of Checkers allows you to blank the screen during the computer's "thinking time," speeding up the process by about 30 percent. Up to 30 moves may be taken back at any point in the game.

At the conclusion of the game, you may start a new game, take back the last few moves, or view the Checkers "movie." The "movie" is a rapid replay of the entire game.

Checkers is an excellent piece of software, from its well written and complete manual (it even gives the history of the game) to its quality packaging. There are so many features and variations to this game that it will satisfy both the casual and the professional checkers player.



To summarize, Checkers is the definitive "computer" game. Although it costs slightly more than a typical shoot 'em up, it is a quality product and should be purchased by anyone who wants to see an excellent example of state-of-the-art software. It plays a mean game, too.

BASIC/XA

Atari Program Exchange
P.O. Box 3705
Santa Clara, CA 95055
(800) 583-1862
$29.95, 16K — cassette
$29.95, 24K — diskette

Reviewed by Jordan Powell

BASIC/XA is a development tool for Atari BASIC programmers which adds facilities to make programming easier and faster. It allows you to: list, rename and cross reference the use of variables, renumber programs, delete ranges of statements and check a program for errors.

To use BASIC/XA, boot it and make sure you have a MEM.SAV file on your disk, then begin your usual work on your programs. BASIC/XA uses about 4000 bytes of memory and allows the use of all normal DOS commands but one. All XA functions are called from a DOS-like menu which itself is called by typing DOS. To get to the real DOS menu you select option J on the BASIC/XA menu. Entering commands to XA is like using Atari DOS. Select the letter function you want and you will then be prompted for further information as necessary.

Information on program variables can be obtained with three different commands. The List Variables command lists all of the variables used in your program, along with the variable type and the total number of variables used. Command B, Variable Values, lists all the variables in your program, the values of simple variables such as x and the dimensions of arrays and strings. The Cross Reference command lists all variables and the statement numbers of the lines that reference them. Variable names can also be changed with the Change Name command wherever they occur in the program. Any of the variable reports can be listed to the screen, printer, cassette or to a disk file.

Additional features include capabilities that delete a range of lines and renumber the program in any increment from any starting line. Also, the Check Program command looks for references to line numbers that don't exist or that are greater than allowed by BASIC. It also checks for invalid GOTO, GOSUB, TRAP, RESTORE or LIST statements, INPUT statements with no input variables after them and for BASIC syntax errors. BASIC/XA can be customized to write to 40 or 80-column printers and it can be transferred to disk or tape.

There is one important feature lacking however, and that is automatic line numbering. A limitation of the program is that the Duplicate Disk command cannot be used with XA in your system. You must also make sure that IOCB #5 is closed before you call BASIC/XA. If you do a moderate to heavy amount of BASIC programming, and don't have much RAM to spare, you'll like this program.

COSMIC BALANCE

Strategic Simulations, Inc.
465 Fairchild Drive — Suite 108
Mountain View, CA 94043
(800) 277-1617 Ext. 335 (outside Cal.)
(800) 772-3545 Ext. 335 (Cal. only)
$39.95, 48K — Diskette

Reviewed by Roger Fairchild

Cosmic Balance fills a large gap in the Atari lineup. It is among the most comprehensive tactical space-battle simulations available. Taking the Star Trek genre a step further, it allows you to design and build your ships from the keel up.

Once booted, the game menu appears, offering you the option of playing the computer on one of four skill levels, or playing a friend in one of five different scenarios.

Now you decide just what characteristics your ship will have. A dazzling array of design specifications confronts you: variable strength shields divided into eight arcs around your ship, armor plating, engines (for recharging damaged shields and powering up weapons), warp drives (speed and maneuverability), weapon systems (including phasers, guided missiles, disruptors, plasma torpedoes and fighter swarms), defensive satellites, tractor beams, transporters and even marines to board your opponent's ships.

Once you and your opponent have completed ship design, you then begin the scenario you have chosen. Orders are issued to your ship regarding course, speed, weapons targeting and firing. For the execution phase of each turn, the screen switches to a graphic display which shows all ships' positions, direction of travel and relative speed. When weapons are fired, they are shown as a streak of light from the firing ship to the target. The familiar phaser sound accompanies the battle scene. Text at the bottom of the screen provides a blow-

continued on next page

continued from page 111

by-blow description of the effects of your fire. The graphics are well done and add a sense of realism and immediacy; but this is not a graphics oriented game.

Documentation takes the form of a professionally written 29-page pamphlet. The pamphlet covers all facets of the game from set-up to a listing of typical ship designs. To get you started right away, you can select scenario one, which provides each player with one computer-designed ship. This will allow you to gain some practical experience that will provide some insight into building your own ship.

Cosmic Balance allows you to save single ship designs or even an entire game to disk. Besides the obvious uses, this feature allows you to use your ships in Cosmic Balance II, a strategic level addition to this game.

KOALAPAD

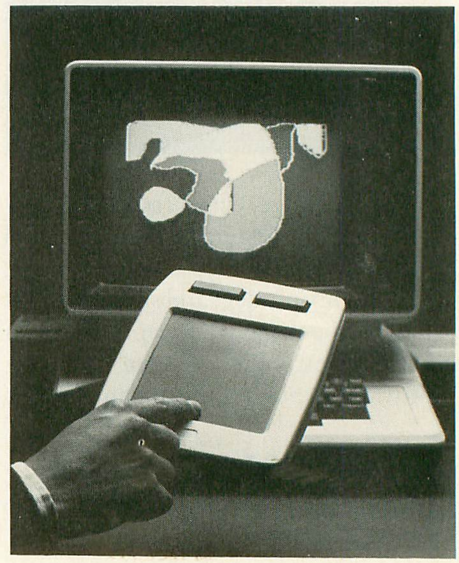
Koala Technologies Corp.
4962 El Camino Real, Ste. 125
Los Altos, CA 94022
(415) 964-2992
$125.00, 32K — touch tablet & disk

Reviewed by Clyde Spencer

The graphic powers of the ATARI computers have been advanced again by delivery to market of a long-awaited new peripheral — the **KoalaPad** touch tablet. It is a small, light unit, about the size and shape of a textbook, that you can use easily in your hands or on a desk top.

The KoalaPad comes with a stylus, instruction manual, and a demonstration graphics program called Micro Illustrator. The tablet itself appears to be well-built. It is housed in an off-white molded plastic case similar in styling to the ATARI 800. KoalaPad plugs into your ATARI through the joystick ports with a standard ATARI controller plug. The active drawing area is $4\frac{1}{4}'' \times 4\frac{1}{4}''$ for a potential resolution of approximately 0.02 inches per pixel. You can use either your finger or a special stylus to activate the drawing area. It also has two trigger buttons on the top.

It may be used either as a sketch pad for drawing, or in conjunction with removable overlays as a menu controller. It can also be used as a replacement for



some applications which use paddles, as long as the paddle triggers are not required.

Micro Illustrator, from Island Graphics, is a drawing package similar to Datasoft's Micropainter or the software which comes with the Versawriter drawing board system. It allows you to draw, fill with color, magnify, and perform other graphics manipulations.

Micro Illustrator is menu driven, with three sections in the menu. The top section of commands determines the effect accomplished by input from the KoalaPad drawing surface. Other sections let you adjust the size and shape of "brush," and select the color for draw and fill operations.

There are 14 different drawing commands, and you can save or load picture

files to and from disk or cassette. The hue and intensity of any of the four solid colors are variable.

A unique feature of Micro Illustrator is the ability to have one of the colors continuously changing to add movement or animation to the drawing. Another interesting feature, called "mirror," generates a four-fold repetition of anything that you draw, for a kaleidoscopic effect. The program's procedures are logical and straightforward. Manuals are concise and well written, with few errors.

My only disappointment is that the programmers didn't find a way to get more than four solid colors on the screen at one time. However, compared to the Apple version, the program offers a much wider palette of colors. The ATARI offers a total palette of colors of 128 hue/luminance combinations to choose from.

KoalaPad's stylus is made of black plastic, about the size and shape of a pencil, with a conical end tapering to a rounded tip about 0.04" in diameter. It is definitely needed since your finger tends to get tired! Another problem in using your finger is that, because of fatigue and the tendency to lift up when changing direction, the drawing is often left with line gaps.

My review package included a floppy diskette. However, Koala expects to introduce a cartridge version of Micro Illustrator that will run on a 16K ATARI 400. Currently, you need a system with at least 32K RAM and one disk drive.

It is unfortunate that Micro Illustrator will not load graphics files saved by Micropainter or Versawriter.

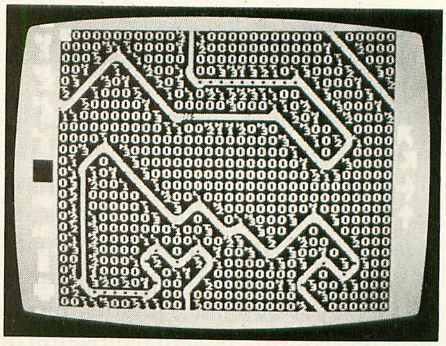
The incompatibility of Micro Illustrator file formats with existing *de facto* industry standard graphics files and incompatibility with paddle controller functions are KoalaPad's most significant drawbacks.

Nevertheless, if you like to do graphics, or want to use touch-activated menu programs, I believe you will find the KoalaPad touch tablet worth buying.

RALLY SPEEDWAY

Adventure International
P.O. Box 3435
Longwood, FL 32750
(800) 323-7172
$49.95, 16K – cartridge

Reviewed by David Duberman



A scrolling car-racing simulation viewed from overhead, **Rally Speedway** does not attempt to compete with point-of-view arcade racers like Baja Buggies and Pole Position on their own ground. Rally Speedway is a true computer game in that you can alter the program specifications to the point of designing and storing your own 120-screen racing tracks.

The 16K cartridge comes with two large racing tracks, each complete with lovely trackside trees, houses, grass, and water. The full area of a track extends over an area 12 screens wide by 10 screens in height. You can race a friend or try to beat your best time.

Before the race starts, you can set a number of parameters such as road conditions, acceleration rate, and maximum speed (from 40 to 100 MPH). As the race takes place, the car (or cars) remains centered on the screen as the racetrack scrolls along beneath. Your car is con-

continued on next page

continued from page 113
trolled with your joystick, and its brakes with the fire button.

Two methods of steering are available. Normally, you have control over the car from your car's perspective. That is, push your stick to the left and the car moves to *its* left, no matter which direction it's traveling. However, if you press [SELECT] at any time, joystick movement will control the actual direction of the car on the screen. That is, push the stick to the right and the car will move to your right, no matter which way it is moving.

Despite the overhead perspective, the game is actually fun to play. Even with a maximum speed of 60 on dry roads (wet and icy are alternatives), it's easy to spin out on a curve and crack up into the trees or some poor innocent's house. When you do, your car bursts into colorful flames. Your driver, who's burning too, runs out of the car, rolls around on the ground to put out the flames, and then rises and gives a friendly wave to let you know he's all right. Then you're set back on the road in the direction you were traveling, ready to go again.



The Make Trax feature is what makes this program special. Choosing from a selection of 20 different types of track sections, you can customize your racetrack layout to your heart's content. For scenery (and obstacles), you can place different kinds of houses (one with a swimming pool), trees, and lakes wherever you want. Since the track area wraps around, you can create very long, complex racetracks. Also, since it's possible to crash near any section of track, you can set the direction the car will be facing when it is set on the track after an accident. You can save your custom tracks to disk or cassette.

The ability to customize is what makes this program a must for racing enthusiasts. If you memorize one track, just create a new one! Another feature might make Rally Speedway equally attractive to beginners. Called "Only In A Computer," this option allows you to go anywhere without crashing!

PINHEAD

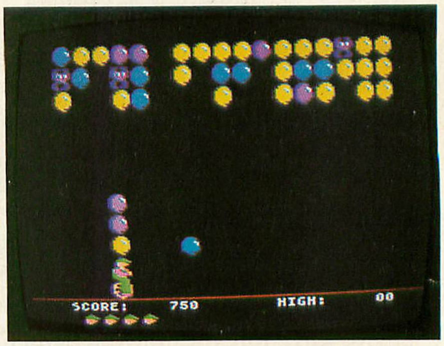
Utopia Software Inc.
58 Millay Rd.
Morganville, NJ 07751
(201) 536-1191
$29.95, 16K — disk & cassette

Reviewed by David Plotkin

Bally-Midway's sequel to the fantastically successful Pac-Man, entitled Kick, died an undeserved death in the arcades. Sporting colorful graphics and good play action, it has nevertheless faded into obscurity for reasons unknown. With the release of **Pinhead**, however, Utopia Software has come to the rescue of ATARI-owning home arcaders. Pinhead is well implemented with good graphics and a superior sound track.

In Pinhead, the player controls a clown mounted on a unicycle. Using a joystick plugged into Port 1, the player guides the clown back and forth along a high wire. Above the clown is a rack of balloons. Periodically, balloons break free from the rack, and your clown must be maneuvered under a falling balloon to pop it on his pointed hat. Missing a balloon causes it to hit the high wire, and the clown to fall to his demise. If the clown does miss the balloon with his hat, he has one chance to recover — hitting the fire button causes the clown's feet to kick out, rebounding the balloon back into the air for another chance. But be careful — other balloons may be breaking loose meanwhile! The balloons in the rack fall at different speeds, with blue being the fastest and the most difficult to catch.

After the first screen is cleared, things get more complicated. In the higher screens, balloons are caught on the pointed hat and will stack up four high before all of them pop and you start catching the next batch. Catching a blue balloon on the top of this stack can be quite a feat! Also present in the rack are little monsters. Catching one of them gets you a bonus, and the little monster will eat all the stacked balloons. But from then on, you must catch balloons and/or other monsters on top of the monsters you've already caught, so it gets more difficult. Also complicating matters are bombs, which must be avoided altogether, and buckets, which can be caught but not kicked.

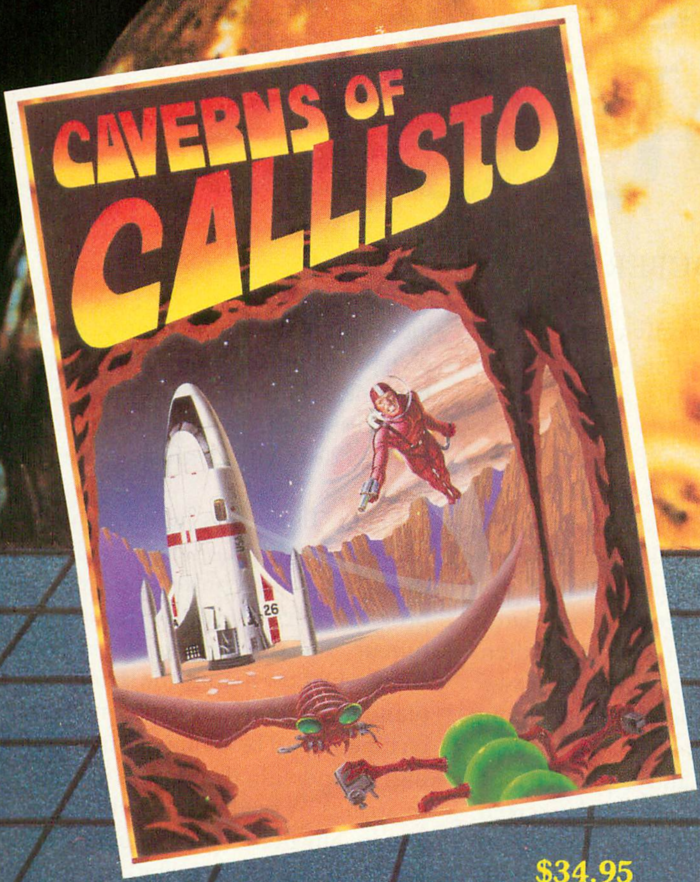


The peripheral aspects of Pinhead are quite well done — there are cute intermissions, where Pac-Man makes an appearance, and superb three-channel music. A different tune accompanies each screen. The animation is very well done. The clown pedals his unicycle realistically, and even looks up at the balloons by tilting his head.

Pinhead has an initially high frustration factor because it is difficult to control the clown with the pinpoint accuracy required. Continued play quickly leads to improved scores, however, so this game should be given a chance to prove itself.

Pinhead is unusual, well done, and exceptionally challenging. It is a worthwhile addition to your game collection.

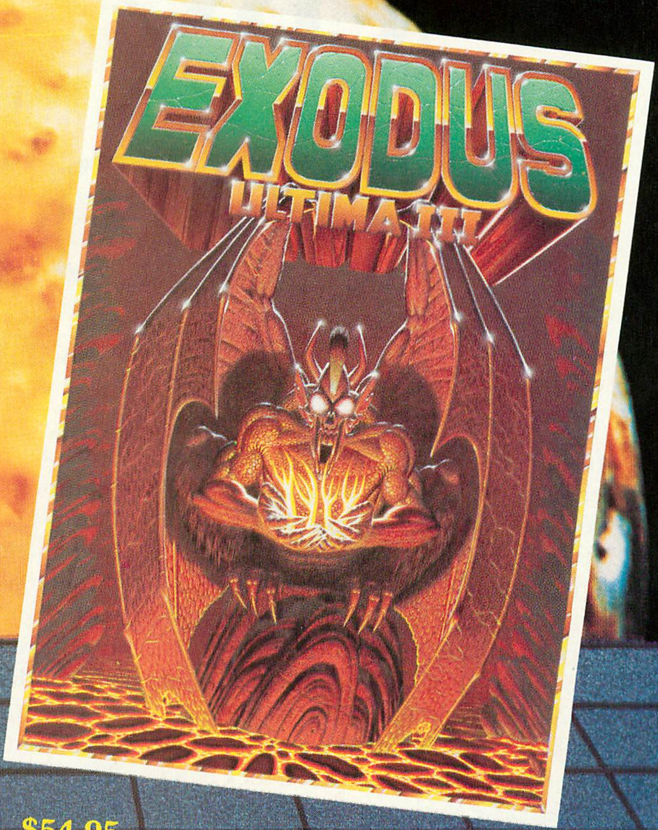
Two Great Games From Out of This World!



$34.95

CREATED BY CHUCKLES

From the depths of Callisto, Origin brings you the excitement of arcade action with the intrigue of adventure gaming. Real time vertical and horizontal scrolling, along with expert color graphics, offer a truly unique entertainment experience. Chuckles has created five levels of caverns filled with treacherous monsters, boiling volcanoes, and secret passages that will challenge even the most experienced player.



$54.95

CREATED BY LORD BRITISH

From the land of Sosaria, EXODUS: ULTIMA III sets a new standard for excellence in fantasy role-playing games. Continuing the tradition of innovation established by Lord British, EXODUS features new animated graphic techniques, full sound effects, and mult-character interplay. Step into our new fantasy world and use your skill and wit to find and destroy the insidious EXODUS!

MOCKINGBOARD ENHANCED

from your local dealer or direct from:

ORIGIN SYSTEMS INC.

18100 Upper Bay Road, Suite 202

P.O. Box 58009
Houston, Texas 77258
(713) 333-2539

Available for Apple II/II+/IIe and for Atari 400/800

ORIGIN SYSTEMS - ORIGINATORS OF EXCELLENCE

SURVEY OF APX SOUND PRODUCTS

by DAVID DUBERMAN

The Atari Program Exchange (APX) offers perhaps the widest variety of programs for the ATARI computers of any software vendor. Among APX's wide selection of educational, entertainment, utility and business programs are several that make good use of the computers' exceptional sound capabilities.

Salmon Run is perennially one of APX's most popular game programs. Its author, Bill Williams, started his career as a synthesizer player with a rock band in his native Michigan. But three months after his father bought an ATARI 800, Bill had completed Salmon Run, which was written in machine language with the Assembler Editor cartridge. The object of the game is to maneuver your salmon upstream past waterfalls and a variety of enemies (bears, seagulls, and fishermen) to the spawning grounds where your fish finds true love. Salmon Run features some of the most realistic sound effects I've ever heard, particularly the sounds of rushing and falling water.

APX's most musically accomplished programmer, Lee Actor, has two programs in the firm's product line. You may be familiar with **Advanced Musicsystem**, a sophisticated musical development tool. The program allows you to compose, play, and store extremely complex musical compositions. Its built-in features permit synchronization and the creation of eight-voice (or more) compositions on tape. For those who prefer to appreciate rather than create good music, Lee has also written **Juke Box #1**. Perhaps the world's only classical juke box, the program offers renditions of Beethoven's "Fur Elise" and Mozart's "String Quartet in E Flat," among others. And an automatic play feature will run through all eight pieces in turn, if you wish. Not just an entertaining program, Juke Box #1 is an excellent demonstration of the ATARI's sound capabilities.

Ringmaster is Gregor Novak's latest educational game for young children. The child must find the correct answer to a mathematical question from among the numbers written on the backs of circus animals (camels and elephants) moving back and forth across the screen. Different circus tunes play throughout the game, and help sustain the child's interest.

Musical Pilot, by Charley Kulas, is a new educational game that helps teach a child the relationship between a note's position on the musical staff and the way the note sounds. The child pilots an airplane (vertically, at center screen) and tries to hit all the notes as they enter the screen from the right and move to the left. In the early levels there is a significant time delay between the sounding of the note and its physical appearance on the screen, but in later levels the note appears almost as soon as it is played.

Insomnia is a sound effects program. Using a graphic depiction of pitch, distortion and volume, you can edit each of four voices to create a wide range of effects, from a train whistle to an exploding bomb. You can combine voices and incorporate the sound routines in your own programs. Insomnia is excellent for beginners who are experimenting with ATARI's sound, because it eliminates the need to deal with confusing numerical data.

Piano Tuner was written by R. J. Morgan, a professional piano tuner. Although it is not a professional tool, the program does let you perform a basic tuneup on your piano. One section shows you how to tune the strings on the piano in sequence, by depicting the correct method of blocking off (or dampening) the individual members of each trio of strings. A second part allows you to choose any individual frequency, either for the tuning of one string or of another instrument. The third section tests the accuracy of your hearing. You pick a note for testing. The program then plays two tones, and you must match the second to the first with your joystick. This exercise is good practice for the actual tuning of your piano or other instrument.

Magical Melody Box is a rarity: an educational program that is a lot of fun! First, you select one of twelve rhythm patterns; then you use your joystick to "draw" a melody on the screen. Once you're finished, the program creates a one-minute sequence of harmonized music from your input. The program thus permits a musical novice to create a finished tune without the slightest knowledge of the technical aspects of composition.



If You Own ATARI, You Should Be Reading ANTIC!

ANTIC™ Magazine, The ATARI® Resource, covers ATARI computers, software, peripherals and game machines in depth.

EACH month ANTIC focuses on the awesome potential of ATARI. You'll learn about Education, Graphics, Communication, Sound and Music, Arcade and Adventure Games, and Data Bases, and that's only the beginning!

SUBSCRIBE to ANTIC and tap into the best source of up-to-the-minute information on the whole incredible world of ATARI. From the heart of the Silicon Valley.

ANTIC Delivers ATARI!



GET The ATARI Resource Today!

- **Send $3** for sample copy to: ANTIC, 600 18th St., San Francisco, CA 94107.
- **Call TOLL-FREE** to start your subscription: 12 issues for $24/ 24 issues for $44/36 issues for $60. **800-772-3545 x.133** in California, **800-227-1617 x.133** everywhere else
- **Ask for ANTIC** at your favorite computer store or newsstand.

Antic™
The **ATARI** Resource

ANTIC™ is an independent monthly publication for ATARI owners and users. ATARI® is a registered trademark of Atari, Inc.

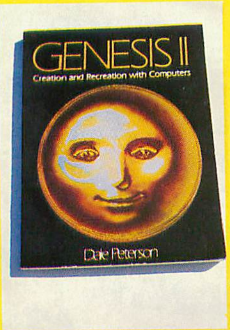
ANTIC PIX GIFTS



64K RAM SELECT

Mosaic

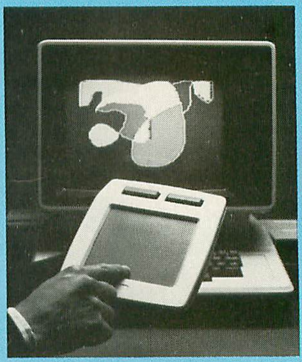
Mosaic has been a big hit lately, because of its 64K RAM memory system. Four banks of 4K RAM above the normal 48K limit, are available so you get 48K RAM hard-wired memory, along with 4K RAM banks of software-selectable additional memory, for 52K of RAM continuous and 64K RAM total. ROM cartridges cannot interfere with SELECT's memory, and it is fully compatible with the 400/800 and all ATARI software and peripherals. The 800 is able to support three of these memory boards, which can upgrade your computer to a whopping 192K. This extra boost of RAM comes in handy for character set or Player/Missile data. Installation of the board involves some simple soldering. The product is test cycled for 24 hours and carries a four-year guarantee. The board alone is $199.00; a cable connector #1, priced at $29.95, is needed for the first 64K added. ATARI 800 owners who wish to add second or third boards will need a cable connector #2 for each addition. These also cost $29.95.



GENESIS II

Reston

The title of *Genesis II* reveals the author's view of the ultimate possibilities of computer technology. It presents the relationship between technology and the arts in a compelling way, moving from DaVinci to Warhol to the maker of *Star Wars*, and explaining how these movers and shakers have embraced or turned away from technology. The author, Dale Peterson, has focused on his favorite American artists, writers, composers, and game designers, and has given their work a forum. An entire chapter is devoted to contemporary visual arts, and features extensive interviews with master computer artists. Another segment covers the history and development of computer games. An eight-page gallery of full-color reproductions includes some of the most famous examples of computer-generated art. Black and white illustrations are also included. *Genesis II* makes an interesting supplement to Hofstadter's *Godel, Escher, Bach: An Eternal Golden Braid*, which should also have a place on your computer bookshelf. It is available in paperback for $15.95 and hardback for $24.95



KOALAPAD

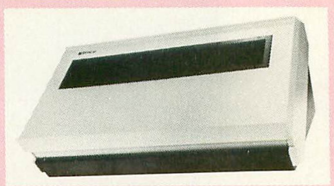
Koala Technologies Corp.

A Koalapad is not the palm of an Australian tree bear; it is the name of a hand-held touch tablet for the ATARI computers. Draw an image with a finger or stylus, and your picture will appear on the video display. This product's ability to reproduce drawn, traced or written material makes it an enjoyable introduction to the world of computers, since it allows the novice to bypass the keyboard and see results immediately. But the multi-faceted Koalapad is not limited to graphics. It also can be operated as a set of nearly 40 special function keys, with custom overlays for any combination of characters or graphics. Used as a game controller, two firing buttons simulate left and right joystick movement. Software packages for use with Koalapad are available, and one program, a flexible graphics utility, is included with the tablet for $125.00.

SOUNDTRAP STRETCH

Trace Systems, Inc.

The old SoundTrap wasn't big enough for Trace Systems; they have now developed SoundTrap Stretch, a 26" wide, 17" deep version of their original acoustical printer housing. The larger surface area permits better sound absorption and reduces noise to an average 44 dba for most 136-column dot-matrix and small daisywheel printers. A "peel-out" slot has been added for bottom-feed printers, and louvers now ventilate the housing. This product sells for $189.00; but for another $49.00, you can get it with power-surge protection outlets, a cooling fan, and a pilot-light power switch. As with the original SoundTrap, Stretch can serve as a document stand, thanks to a tilted lid on which papers can be placed and viewed.



ANTIC PIX GIFTS



MONOCHROME MONITORS

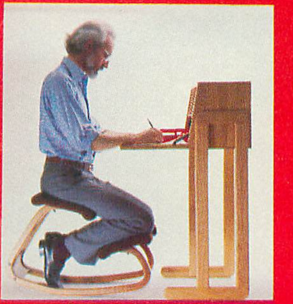
Taxan

Staring at the old TV screen can become uncomfortable after a while. If you'd like to sharpen things up for those long sessions of programming, you should consider a display monitor from Taxan. It comes with either an amber or green screen, and is especially useful with an 80-column board. Monitors require a "composite video signal" such as that available from the ATARI 800's monitor output jack, and this requires a special cable ($20.00). These monitors feature a 12" diagonal screen and can clearly display 80 characters per line with 24 lines per screen. The standard 40-character ATARI lines are also crisp and clear. Brightness and contrast controls make it possible to view game programs in shades of green or amber, although the sound is missing. Units are light-weight and solid-state. Price without cable is $179.95 (green), $189.95 (amber).

BALANS CHAIR

The Sharper Image

How many years does the average computer buff spend sitting down? Whatever the answer, he or she will sit more comfortably in the seat of a Balans. Though the look of this chair may alarm those who like a back rest, the design supports the back naturally, balances the body, and gives the diaphragm plenty of room to breathe. The Balans is made of laminated beechwood, upholstered with 100% wool fabric. The original chair has a standard seat height and can be made to rock gently; the adjustable model features four positions but does not rock. Both styles can be assembled in minutes. Order item #CWN209 from The Sharper Image, 406 Jackson St., San Francisco, CA 94111. The price is $185.00, plus $9.50 for shipping. Colors are brown for the adjustable model and brown or beige for the original. The Smithsonian Institute has a Balans in its permanent collection. Shouldn't you?

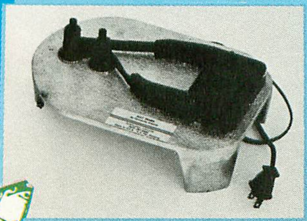




CS 1632 CABINET

Hytec Systems

Organization is made easy by the CS 1632 computer storage cabinet. You can store a computer, monitor, controllers, software, books and peripherals in this compact, functional unit. The built-in, slide-out shelf is set at standard typing height for comfortable use of the ATARI computers. When the computer is not in operation, the fold-up locking door protects it from accidents, pollutants and undesired handling. Controllers slide upside down into the inverted storage rack. The back center panel contains twist tabs (which neatly bind together and conceal wires), as well as a shelf for unsightly transformers. A slide-out software tray accomodates up to 14 cassettes or cartridges, and 30 diskettes. The dimensions of the cabinet are 36" high × 34" wide × 16" deep. Tools necessary for assembly are a screwdriver and hammer. The cabinet is made of simulated woodgrain. State your preference for the finish: golden oak or natural walnut. $89.95 includes shipping fee.



MacINKER

Computer Friends

What this country needs is a good five cent printer ribbon. That's almost what you get with MacInker. This handy device automatically re-inks any ribbon (felt, silk, cotton or nylon) for any computer printer that uses cartridges or spools. When the price of ribbon re-inking is five cents, it may make ribbon replacement obsolete. Computer Friends says a ribbon can be re-inked as many as 20 times and still print as well as it did in its youth. MacInker distributes ink evenly, and the ink contains a special lubricant that improves the life of the print-head. Even the most clumsy of us can easily use this product, as it requires a minimum of effort. When ordering, be sure to specify the printer and model you are using. $54.95 will get you MacInker and a 2 oz. bottle of ink. Include $3.00 for shipping and handling.

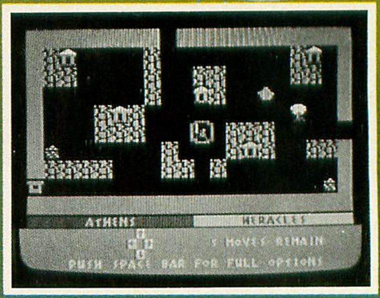
The computer adventure you've been waiting for...

THE RETURN OF HERACLES™

An exploration of Greek mythology translated into modern electronics
by Stuart Smith



The creative mind of Stuart Smith, author of ***Ali Baba and the Forty Thieves***, brings to life the world of mythic Greece in fantastic color and sound! Carefully researched and skillfully programmed, ***Return of Heracles*** is computer entertainment at its best. Twelve difficult and dangerous tasks will be assigned to you by Zeus, and your heroes must accomplish them all. One or more players take on the role of an ancient Greek hero or heroine. There are 19 heroes to choose from, or choose them all! May the gods favor you!



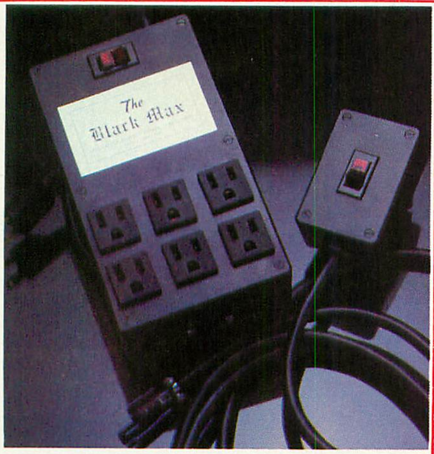
QS QUALITY SOFTWARE
6660 Reseda Blvd., Suite 105, Reseda, CA 91335
(213) 344-6599

For Atari home computers.
On diskette. Requires 48K
$32.95

ANTIC PIX GIFTS

continued from page 119





SPIDER PAC AND BLACK MAX

Compu-Tech

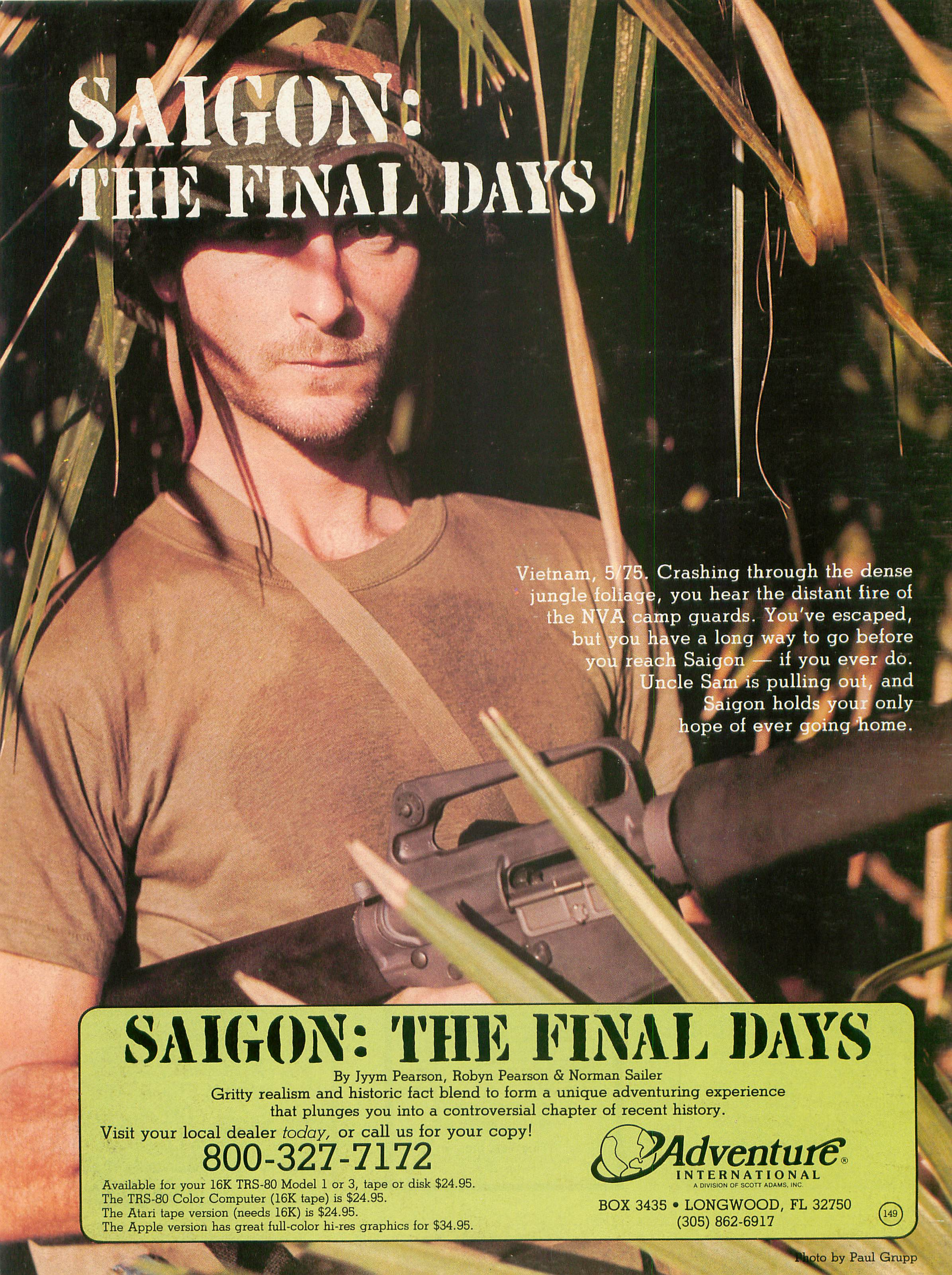
Stop tripping over tangles of cords and power strips! Spider Pac, designed for ATARI computers and peripherals, is an alternative to the jumble of transformers you are currently using. It sports a row of five 9-VAC outlets for use with its five detachable patch cords, as well as three 120-VAC outlets for products that can use household current. Other features include a 15-amp circuit breaker, illuminated on/off switch, spike protection, EMI filtration and RFI filtration. Spider Pac's cousin, Black Max, is a six-outlet spike filter that includes the two previously mentioned filtrations and a mounting bracket. A remote on/off switch plugs into the back of Black Max. The switch comes with eight feet of 14-gauge wire so it can be installed at a convenient spot. Reduced for this holiday season, Black Max costs $124.95, while Spider Pac sells for $134.95. Available from Compu-Tech, P.O. Box 5058, Glendale, AZ. 85306.



VOLKSMODEM

Anchor Automation

If you have been searching for an inexpensive, reliable, 300-baud originate/answer modem, consider the Volksmodem. Five different cables are available to connect it to almost any computer or terminal, making this modem compatible with most other systems on the market. A hybrid of the direct/connect and acoustic modems, this one has no cups, yet allows the user to monitor line status through the telephone. All regular terminal communications software are appropriate for use with the Volksmodem; however, we use **Teletalk** by DataSoft for ANTIC's data communications. Volksmodem includes a full and half-duplex switch, a voice/data switch, and a lifetime warranty. Its state-of-the-art technology also results in a lower power drain than former Anchor modems. $79.95 is the price for the modem; $12.95 for each cable. As a bonus, a subscription to **The Source** (worth $120.00) is included in the cost of the modem.



SAIGON:
THE FINAL DAYS
Vietnam, 5/75. Crashing through the dense jungle foliage, you hear the distant fire of the NVA camp guards. You've escaped, but you have a long way to go before you reach Saigon — if you ever do. Uncle Sam is pulling out, and Saigon holds your only hope of ever going home.
SAIGON: THE FINAL DAYS
By Jyym Pearson, Robyn Pearson & Norman Sailer
Gritty realism and historic fact blend to form a unique adventuring experience that plunges you into a controversial chapter of recent history.
Visit your local dealer today, or call us for your copy!
800-327-7172
Available for your 16K TRS-80 Model 1 or 3, tape or disk $24.95.
The TRS-80 Color Computer (16K tape) is $24.95.
The Atari tape version (needs 16K) is $24.95.
The Apple version has great full-color hi-res graphics for $34.95.
Adventure®
INTERNATIONAL
A DIVISION OF SCOTT ADAMS, INC.
BOX 3435 • LONGWOOD, FL 32750
(305) 862-6917
149
Photo by Paul Grupp

LISTING CONVENTIONS

Table Information

Our custom font listings represent each ATASCII character as it appears on the video screen. You generate some characters by a single keystroke, for example, the regular alphabet. Others require a combination or sequence of keystrokes. In this table, ESC means *press and release* the escape key before pressing another key. CTRL or SHIFT means *press and hold* the control or shift key while simultaneously pressing the following key.

The Atari logo key (⩚) "toggles" inverse video for all alphanumeric and punctuation characters. Press the logo key once to turn it on; press again to turn it off. In the XL line there is no logo key; inverse video is controlled by a key on the function row. Decimal values are given as reference, and correspond to the CHR$ values often used in BASIC listings.

NORMAL VIDEO

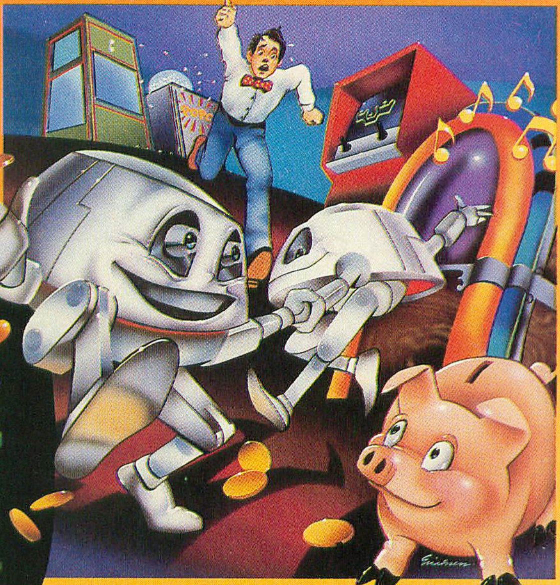
FOR THIS	TYPE THIS	DECIMAL VALUE
	CTRL ,	0
	CTRL A	1
	CTRL B	2
	CTRL C	3
	CTRL D	4
	CTRL E	5
	CTRL F	6
	CTRL G	7
	CTRL H	8
	CTRL I	9
	CTRL J	10
	CTRL K	11
	CTRL L	12
	CTRL M	13
	CTRL N	14
	CTRL O	15
	CTRL P	16
	CTRL Q	17
	CTRL R	18
	CTRL S	19
	CTRL T	20
	CTRL U	21
	CTRL V	22
	CTRL W	23
	CTRL X	24
	CTRL Y	25
	CTRL Z	26
	ESC ESC	27
	ESC CTRL −	28
	ESC CTRL =	29
	ESC CTRL +	30
	ESC CTRL *	31
	CTRL .	96
	CTRL ;	123
|	SHIFT =	124
	ESC SHIFT CLEAR	125
	ESC DELETE	126
	ESC TAB	127

INVERSE VIDEO

FOR THIS	TYPE THIS	DECIMAL VALUE
	⩚CTRL ,	128
	⩚CTRL A	129
	⩚CTRL B	130
	⩚CTRL C	131
	⩚CTRL D	132
	⩚CTRL E	133
	⩚CTRL F	134
	⩚CTRL G	135
	⩚CTRL H	136
	⩚CTRL I	137
	⩚CTRL J	138
	⩚CTRL K	139
	⩚CTRL L	140
	⩚CTRL M	141
	⩚CTRL N	142
	⩚CTRL O	143
	⩚CTRL P	144
	⩚CTRL Q	145
	⩚CTRL R	146
	⩚CTRL S	147
	⩚CTRL T	148
	⩚CTRL U	149
	⩚CTRL V	150
	⩚CTRL W	151
	⩚CTRL X	152
	⩚CTRL Y	153
	⩚CTRL Z	154
	ESC SHIFT DELETE	156
	ESC SHIFT INSERT	157
	ESC CTRL TAB	158
	ESC SHIFT TAB	159
	⩚CTRL .	224
	⩚CTRL ;	251
	⩚SHIFT =	252
	ESC CTRL 2	253
	ESC CTRL DELETE	254
	ESC CTRL INSERT	255

A million laughs

SPARE CHANGE™ You are the game-happy owner of the Spare Change Arcade. Two fun-loving, but overworked Zerks—the main characters in your most popular game—have broken loose and are trying to retire from the business. You try madly to stop them. If you can get a coin into the juke box, the Zerks get so caught up in the music, they drop everything and start dancing. You also try popping popcorn and making a pay phone ring—which immediately makes the Zerks stop, answer and start a wild conversation. If you "win" the game, there are rib tickling cartoons by the Zerks to reward your efforts. It's a game full of sight gags, surprises and comedy. From the best. Brøderbund! **For the Apple® II, II+ and IIe. Coming soon for the Atari® home computers in disk format.**

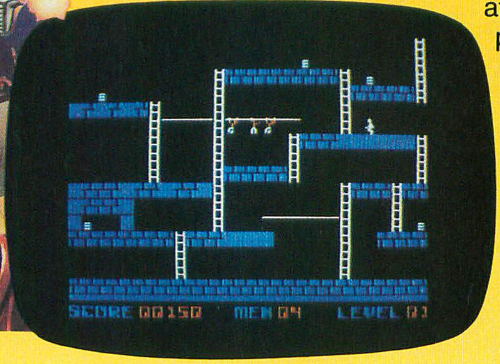




and an endless challenge



LODE RUNNER™ Here's a game that will never stop challenging you. That's because Lode Runner is more than a spellbinding, fast-action game with its 150 different mind-boggling game screens. Lode Runner is also an easy-to-use Game Generator that lets you create your own games. Without any knowledge of programming, you can easily design unique Lode Runnner screens, then bring them to action-packed life. You will maneuver through scene after scene, running, jumping, drilling passages and outfoxing enemy guards in a secret underground hideaway as you pick up chests of gold stolen from citizens of the Bungeling Empire. There's no end to the thrills, chills and challenge. Of course, it's from Brøderbund! **For the Apple II, II+ and IIe. Coming soon for the: Atari home computers (disk and cartridge); Atari 5200™ Super System; Commodore 64™; VIC-20™; IBM® PC.**



Ask your Brøderbund dealer for sneak previews.

Brøderbund Software **Discover the Difference**

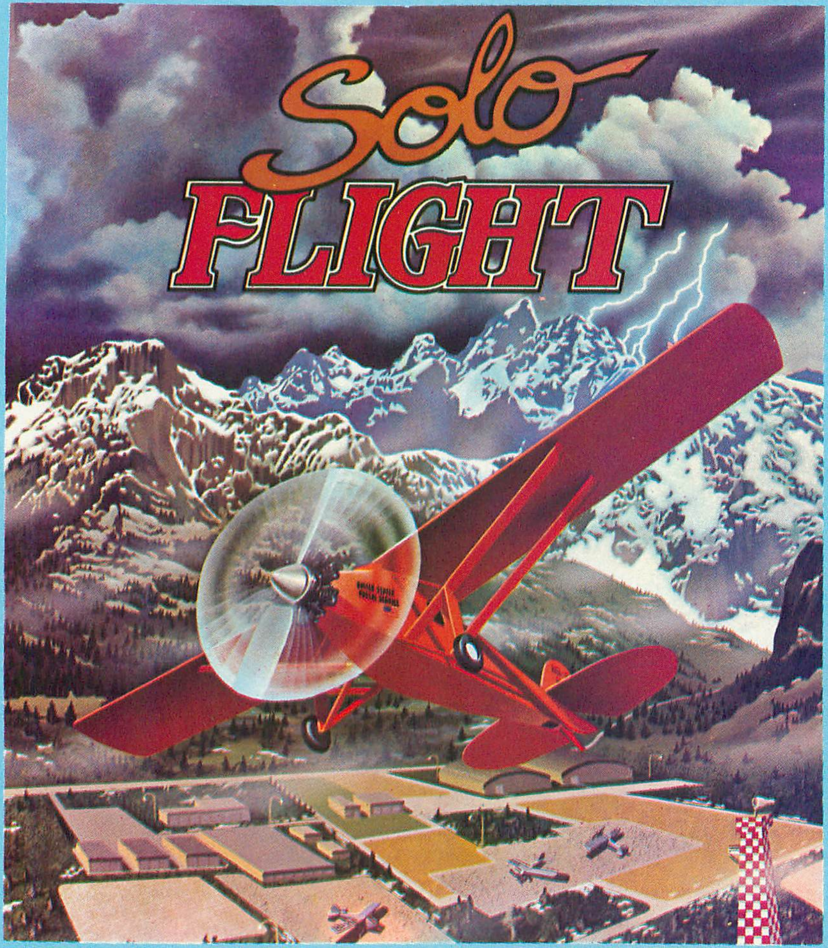
17 Paul Drive San Rafael, CA 94903

AT LAST!!! A REAL FLIGHT SIMULATOR!!!

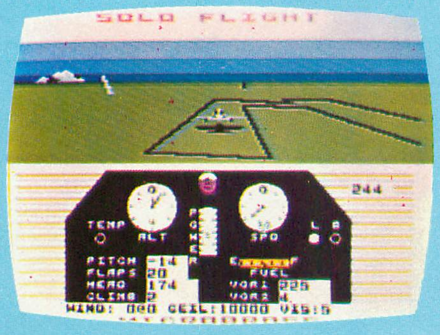
— From The Creators of HELLCAT ACE!

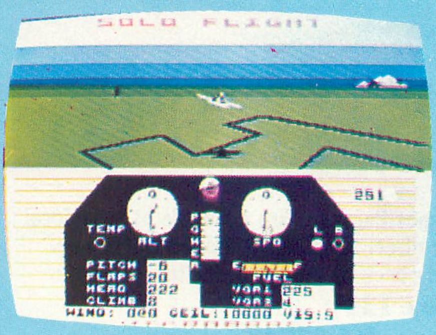
A real flight simulator allows the pilot to practice takeoffs, landings, cross-country navigation, and emergency procedures in Day, Night, Cross-Wind, and Instrument Flying scenarios! This practice requires realistic three-dimensional terrain graphics, actual instrument panel configurations, and a realistic simulation of the thrill and challenge of the flight experience! The experienced fighter pilots of MicroProse bring you the excitement and joy of flying with SOLO FLIGHT!

- Three Dimensional Terrain Graphics
- Multiple Airports and Runways
- Dual Radio Navigation Instruments
- Full Feature, Actual Configuration Instrument Panel
- Multiple Air Navigation Charts
- Instrument Approaches



- Takeoffs
- Landings
- Cross-Country Navigation — Day, Night, VFR and IFR Flying
- Emergency Procedures Practice
- Air Mail Delivery Game for 1-4 Players
- Smooth Landing & Good Navigation Scoring
- For All Atari Computers, Disk or Cassette . . . $34.95
- Coming Soon for Commodore 64





Look for MicroProse's two new exciting real time combat simulations — MIG ALLEY ACE & NATO COMMANDER.
Write or call for our Free Catalog.

If you cannot find our games at your local store, you can order by MasterCard or VISA, Money Order, COD or Check. Add $2.50 for Postage and Handling. Maryland Residents add 5% Sales Tax.

MicroProse Software

10616 Beaver Dam Road, Hunt Valley, MD 21030
(301) 667-1151

DEALER INQUIRIES INVITED.

ATARI and Commodore 64 are the registered trademarks of ATARI, Inc. and Commodore Business Machines

Will This Be His Final Flight?

It looks like Santa may just miss Christmas this year. Since the exciting games from **MMG Micro Software** (for the ATARI, APPLE and COMMODORE systems) have arrived, he hasn't been able to tear himself away from his terminal long enough to fill his sacks. He's playing FINAL FLIGHT!—a thrilling flight simulator set in a descending aircraft surrounded by tricky weather conditions with full instrumentation and many options. To play this and other thrilling games from **MMG Micro Software**, you need a combination of skill, strategy and speed. So ask Santa for MMG Micro Software games this year. On second thought, maybe you'd better go out and buy them yourself—it looks like it could be a long wait.

MMG
micro software



COMMODORE is a registered trademark of COMMODORE Business Machines, Inc.

ATARI is a registered trademark of ATARI, Inc.

APPLE is a registered trademark of APPLE Computers, Inc.

MMG Games Packages are available at your local dealer or direct from **MMG Micro Software**. Just send check or money order to:

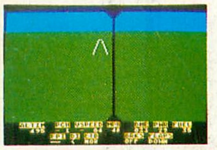
P.O. Box 131
Marlboro, NJ 07746

Or for MasterCard, Visa, and C.O.D. deliveries call:

(201) 431-3472

Please add $3.00 for postage and handling. New Jersey residents add 6% sales tax.

Great Games from MMG!



FINAL FLIGHT!

Imagine yourself at the controls of a small, single engine plane, 10,000 feet in the air, on your final approach to the runway and safety. You're running low on fuel, but your instruments show that you're on the glide path, and lined up with the runway. It's a beautiful, sunny day, and you can see the airport in the distance, across the grassy fields. But the crosswind is tricky, there are other planes in the air, and it will take all your skill to land safely. You're coming down now, and the runway is getting closer. A bit left, OK, now lower the power, fine, now put down the landing flaps. Pull the nose up a bit more, you're a little low. Watch the power! Don't stall! OK. Here comes the runway. Your pulse quickens, and finally you hear the squeal of your tires on the pavement. You're down, but watch it, you're pulling right! Brakes! Brakes! Left more! OK, you've stopped, you've landed safely. Good job!

The first real-time flight and landing simulator for the ATARI and COMMODORE is now available from MMG Micro Software. Written entirely in machine language, there are four levels of difficulty, and you may choose clear or foggy weather, with or without instruments, and with or without the real-time view from the cockpit. Multiple screen updates per second give a realistic feel of flying. Disk or tape available for COMMODORE and ATARI.

24K $29.95



TIMBER! NEW!

TIMBER! is an action-packed arcade style game with multiple levels of play and difficulty. You're Blackjack Daniels, the greatest lumberjack that ever set foot into an ATARI computer! Imagine yourself in the deep dark forest chopping down trees for the Upland Logging Corporation. Your boss has sent you on a very important mission and your job depends on the successful completion of that mission. You are to clear the forest, chopping down trees into cords so that the logging trucks may easily transport them to the mill.

But things aren't as rosy as you thought they might be. You've noticed several forest creatures looking at you as you're trying to meet your logging deadline. Some of them are downright unfriendly looking! You quickly realize that you will be short of your quota of trees in this area, and you'll need to move on to a new woodland area to get enough trees downed. But, everywhere you turn, you see snakes, bears, and other forest creatures. To top everything off, your ax is getting dull and you're finding out that you must hit the "sweet" part of the tree to make it fall.

Time is running out! You must race on to meet the deadline. You quickly enter a mole hole as a snake is about to strike and find out that it comes out in another part of the forest. In fact, there are mole holes all around you and by jumping into them, you find shortcuts to other parts of the forest.

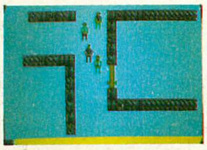
You can't swim and the river is flowing rapidly. You know that your only way to get to the trees on the other side of the river is to cross the bridge. You look around. Oh! Here comes a bear. You quickly cross the bridge and you're temporarily saved from the bear.

By the way, I'm the boss now and I need someone to perform an emergency mission for me. Will you be brave enough to try it? TIMBER! is all machine language. Requires 40K RAM, a disk drive and 1 joystick. Disk only for ATARI.

40 K $29.95

THE ABRAXAS ADVENTURE SERIES No. 1: NEW!

Assault On The Astral Rift



First Program of the New ABRAXAS Series

Adventure enthusiasts, take heart! The ultimate adventure series has arrived, from MMG Micro Software. ASSAULT ON THE ASTRAL RIFT is the first in the new ABRAXAS Adventure series and you'll not soon tire of its many challenges. It's a multiplayer adventure, also playable by a single player, with graphics and music unlike any seen or heard before. Imagine, really being able to read minds, to think in totally foreign languages, and to work together toward the ultimate goal of saving our universe. Imagine an adventure game different with each play. Isn't this why you bought your computer?

You are a member of a small, select band of people with a crucial secret, charged with the responsibility of maintaining the universe as we know it. One of your group has discovered the existence of alternate universes, populated by creatures known on Earth only by our legends. Far worse was the discovery that some of them have learned to travel between the many universes, and, in doing so, have weakened the fabric of our universe. They must be stopped, and you and your comrades are the only ones who can do it!

Your quest begins in a huge stone castle recently converted to a hotel. The guests left abruptly when strange occurrences began, but you know the real nature of these strange events. Time is crucial, and you'll have to begin your journey now. The time holes have begun to open, the first sign of the weakening of the fabric of our universe!

This first program in the ABRAXAS Adventure Series, ASSAULT ON THE ASTRAL RIFT, requires 48K and 1 disk drive. Available on disk only for ATARI.

48K $39.95



Phoenix Lair NEW!

PHOENIX LAIR is an arcade style game comprised of 10 boards and 10 speed levels. It is unlike any game on the market today. Multiple strategies, an interlude jousting challenge between boards, bright and lively colors and music add to the already superb play of this completely unique and different game. Game Play: The game begins at board one and advances to higher boards after successful completion. Many obstacles are encountered on the various boards as points are accumulated. At the beginning of each board, the Phoenix must leave its lair in search of enemy eggs. The Phoenix flight is controlled in height by the joystick button, and in direction by the joystick itself. After successfully destroying at least six of these eggs the Phoenix must return to the far right side of its lair. Points are awarded based on the total number of eggs destroyed and the time in which it took to complete the mission. A fast mission will result in additional bonus points. You begin with 5 lives and gain additional lives at boards 7, 9 and 10. PHOENIX LAIR is all machine language. Requires 40K RAM, a disk drive and 1 joystick. Disk only available for COMMODORE and ATARI.

40K $29.95



Rat Race NEW!

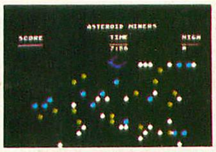
RAT RACE is an action packed arcade-style game with multiple levels of difficulty and challenge. Colorful graphics and superb music enhance the excitement of the game.

Picture yourself in a fast food restaurant. The restaurant is so busy that as soon as food is prepared, the chef just throws it wherever he has room. The restaurant is obviously very messy and in much confusion! Your job is to gather the food for the orders and place it into the proper bin on top of the screen. The french fries go into the french fry bin, the hamburgers into their own bin, and so on.

Sounds simple, doesn't it? Just gather the food and put it into the appropriate bin. But you know better than that, don't you? There are a few minor problems. Since the food is all over the place, some of the local rats have found the restaurant a very attractive place to hang out for lunch, since it is always so sloppy! Generally, they restrict their activities to certain areas of the screen, but they're so fast, it's a race for your life. If they bite you, you'll begin again with one fewer life. The excitement mounts as the degree of difficulty builds. After you've cleared a few boards, you'll see the infamous super rat, who races anywhere with only one thing in mind—to get you! RAT RACE is all machine language. Requires 40K RAM, 1 disk drive and 1 joystick. Disk only for ATARI.

40K $29.95

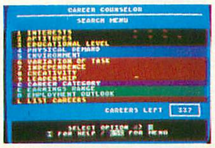
Programs That Teach from MMG



Asteroid Miners

ASTEROID MINERS—A UNIQUE GAME TUTORIAL—is truly that. A 32K game written in BASIC with numerous machine language subroutines, it has 3 levels of difficulty. At the easiest level, it's a race against time; at the hardest, strategy and speed are both critical. Can you beat the high score before time runs out? Get the valuable asteroids, but avoid the duds. Above all, BE CAREFUL! One mistake, and well...ASTEROID MINERS comes with a 50-page book which completely explains every line of the program. The source codes for the BASIC and assembly language programs are included, and fully explained. See how these advanced functions are implemented in a working game! You'll learn machine language routines to relocate the character set, zero the player-missile graphics area of memory, move players, and to put a countdown timer on the screen. Use these routines in your own programs! Every aspect of the program is described in detail, from redefining character sets, to creating multicolored and multifunctional players, to multiprocessing using the vertical blank interrupt. Music, extensive sound and color graphics—in short, a complete tutorial on the advanced functions YOU can use with your ATARI! Disk or tape for ATARI only.

32K $34.95



MMG CAREER COUNSELOR

A unique and fascinating way to explore the important world of careers. Take the first steps toward discovering the careers that are right for you. It is designed to be used at home, in schools, or in libraries by a wide variety of people. The "Career Search" technique used in the program provides a combination of education, fun, and a sense of adventure, making it as valuable for adults as it is for students.

You enter your likes and dislikes concerning interests, abilities, nature of work and other goals through a set of easy to use menus and displays. The program will generate a list of careers which satisfies your preferences. Through repeated use of the "Career Search" process you gain valuable, life-long insights into your career goals and the hundreds of careers stored by the program

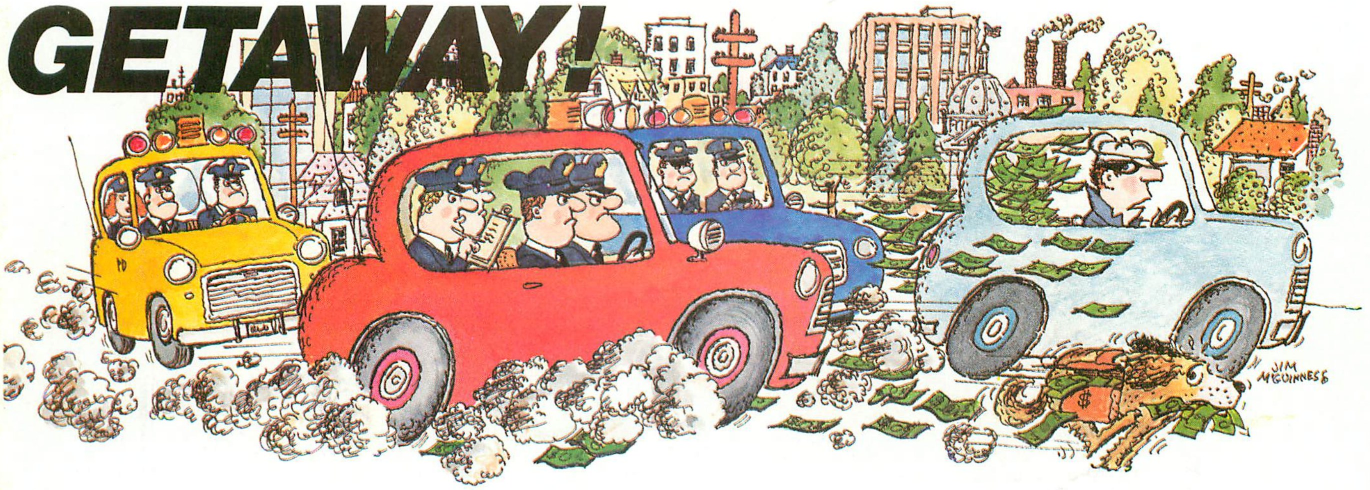
The program also features a "Career Dictionary," which is another source of clear, concise information. This feature allows you to quickly and easily obtain descriptions of all the desired careers. Disk only available for ATARI.

32K $59.95 - Expanded APPLE version available on disk only requires **48K $129.95**

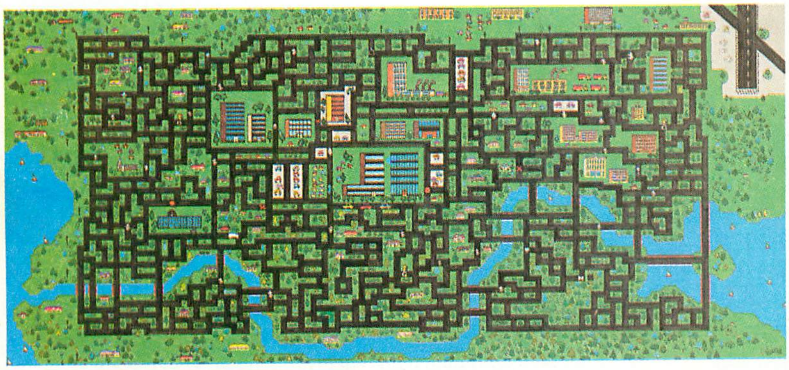
ADVERTISERS LIST

This is provided as a convenience and as a courtesy to advertisers. ANTIC does not guarantee accuracy or comprehensiveness.

GETAWAY!



You've got the loot ... now, *GETAWAY!* to a great new game from the Atari® Program Exchange!



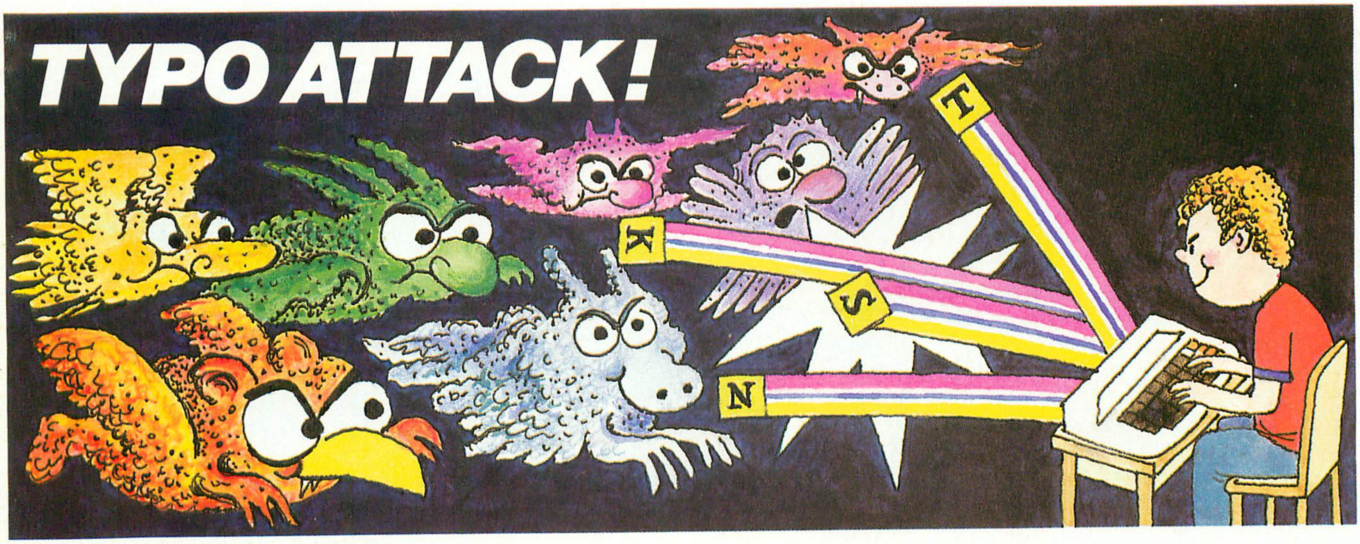
It's *all* there! The squall of sirens, the crazy turns down endless city streets, the anxious search for ill-gotten gain, the race against time for a safe place to stash your cash! Now your gas tank is nearly empty and night is about to fall. The coppers are closing in fast. Before you learn again that crime doesn't pay...Quick! ***GETAWAY!***

Ask for *GETAWAY!* at your local Atari software retailer, or order direct. Phone 800-538-1862, or 800-672-1850 in California. Or write Atari Program Exchange, P.O. Box 3705, Santa Clara, CA 95055.

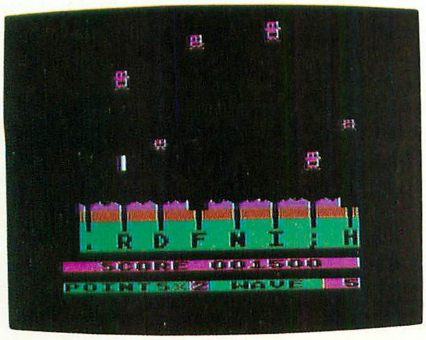
Cassette (410)	APX-10195 32K	$29.95
Diskette (810)	APX-20195 32K	$29.95

For direct orders, add $2.50.

TYPO ATTACK!



You're in for a nasty spell ... unless you stop the Typos!



In the dusky world beneath your keyboard the gruesome Typos dwell ...waiting to attack! Term paper due tomorrow? Got to get that book report typed? Fool! The Typos will devour your letters as you type! That could spell D-O-O-M-E for *you!*

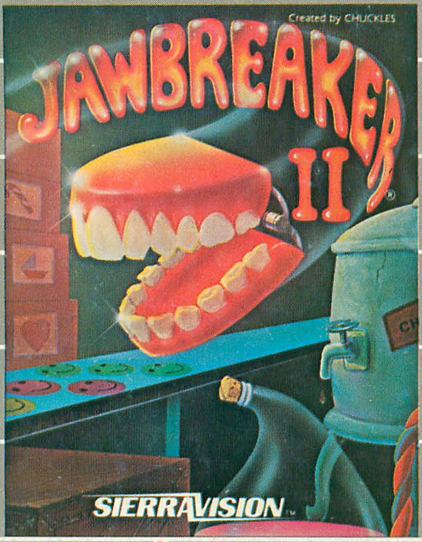
Before you start typing, get down to the real work: destroy the Typos before they destroy your proase... uh, proze...prrrose...Oh NO! THE TYPOS!!! Get ***TYPO ATTACK***, a grand and glorious game from Atari® Program Exchange. It might even improve your typing!

Ask for ***TYPO ATTACK*** at your local Atari software retailer, or order direct. Phone 800-538-1862, or 800-672-1850 in California. Or write Atari Program Exchange, P.O. Box 3705, Santa Clara, CA 95055.

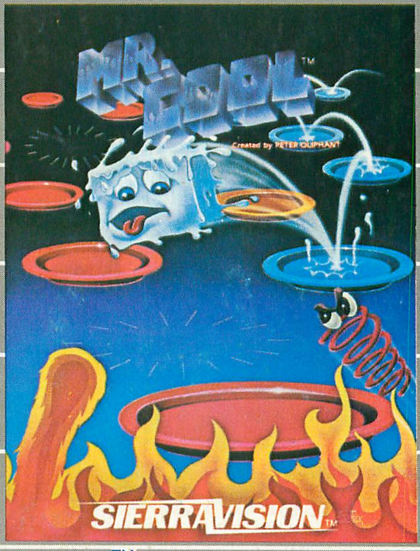
Cassette (410):	APX-10180	8K	$29.95
Diskette (810):	APX-20180	16K	$29.95

For direct orders, add $2.50.

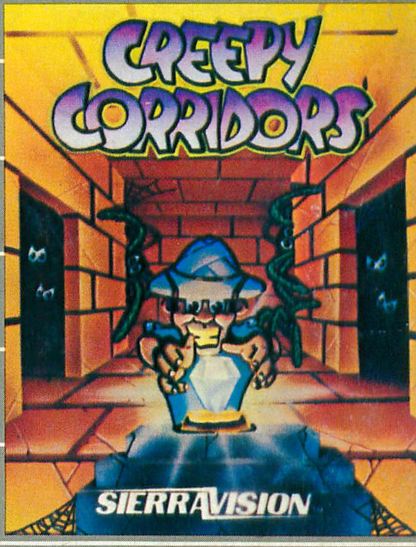
CARTRIDGES FOR ATARI® HOME COMPUTERS



JAWBREAKER® II - Now a new and deliciously different action game to follow the all-time best seller. A challenging new twist on an old favorite.



MR. COOL™ - A furnace of fun. Hop about the pyro-pyramid while avoiding menacing hot springs and shooting fireballs.



CREEPY CORRIDORS™ - Crawling critters will be chasing you all over the screen in this addicting action game. An exciting race to gather jewels. . . and save your life.

Mr. Cool, Creepy Corridors and Jawbreaker II are now available on cartridge for the Atari 400, 600, 800, 1400 and 1450 computers. These and other titles are selectively available for the Apple II, Commodore 64, IBM-PC and Vic-20 from your local software dealer.

Sierra ON-LINE